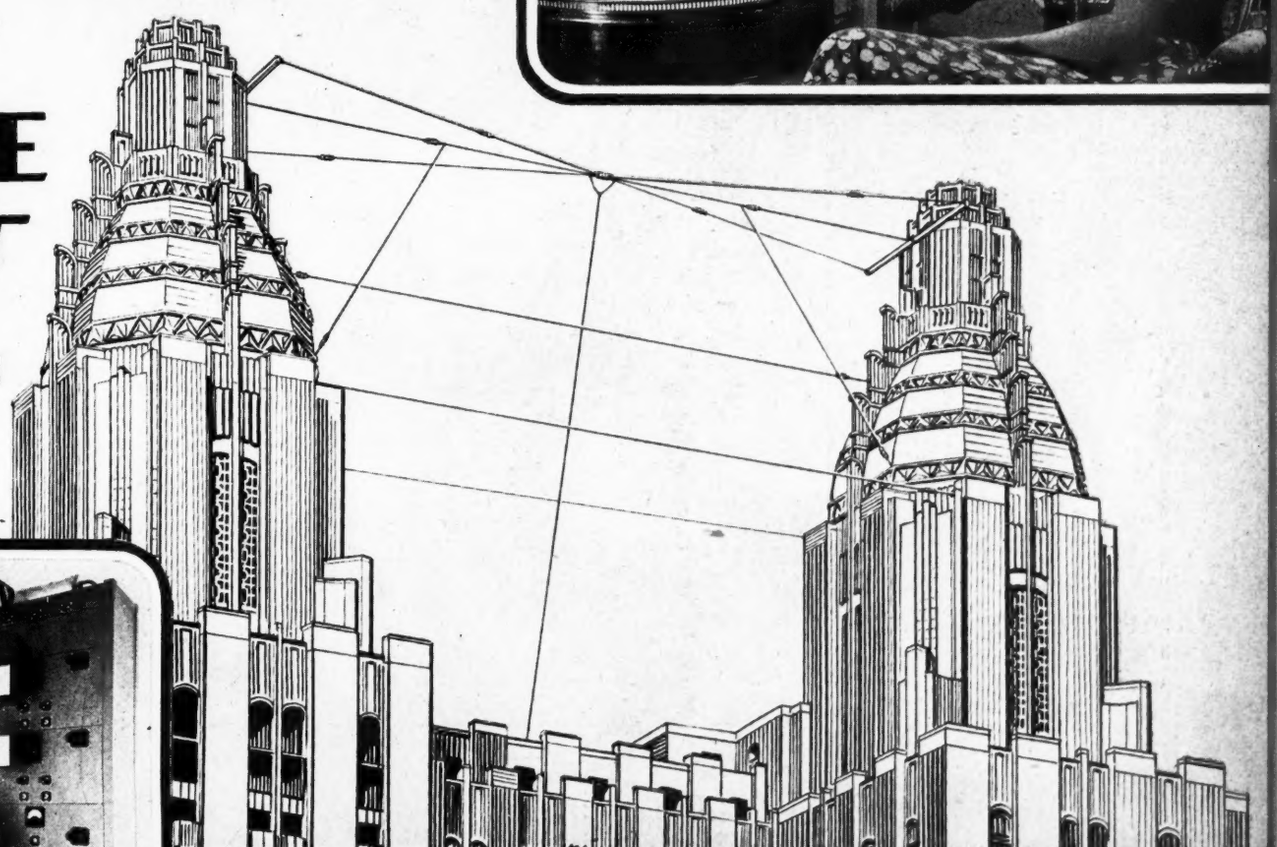
THERE'S MONEY TO BE MADE IN RADIO!

RADIO NEWS
AND
SHORT WAVE RADIO

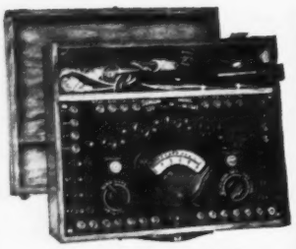
...ORLD'S LARGEST
...LL-WAVE SET

...E PAGE 71



A Publication Devoted to Progress in Radio

Television	Service Work	Set Building
Electronics	Engineering	Short Waves
Broadcasting	Experiments	DX Reception
Applications	Measurements	Amateur Activity



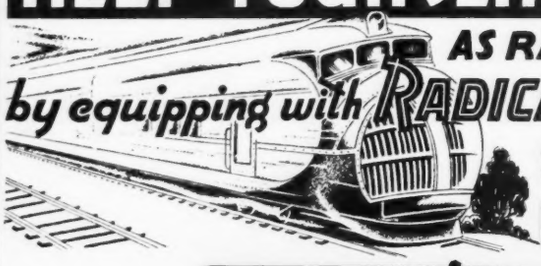
SUPREME 339—DE LUXE ANALYZER
A super-analyzer with direct resistance ranges up to 20 Megs, with self-contained power supply and many other features . $39.95

SUPREME 89—STANDARD TUBE TESTER
A new low priced Tube Tester, featuring Supreme's famous Neonized leakage test $34.95

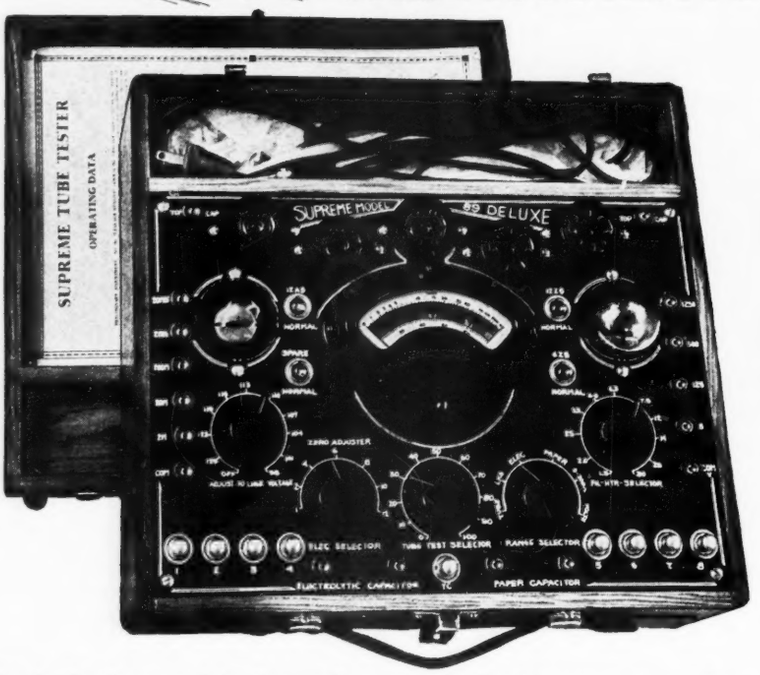
QUICK FACTS — — 89 DeLuxe

1. Simple to operate. (1) select filament voltage, (2) set tube selector per chart, and (3) press a button.
2. Accurate. New circuit tests all tubes at RATED LOAD.
3. Rugged. Cannot be damaged by shorted tubes.
4. Fool-proof. Only 5 sockets—a tube cannot be placed in wrong socket.
5. Neon Leakage tests. Detects leakages and "shorts" between ALL tube elements and indicates faulty elements.
6. Sensitivity of neon leakage test LIMITED so as not to discard good tubes.
7. Quality test detects open circuited elements.
8. All leakage and "short" tests while tubes are heated.
9. Extra handling avoided by making leakage and short tests in same socket used for Quality test on English Reading "Good —Bad" Scale.
10. Tests all tubes without adapters.
11. Fixed ratio between tube and circuit resistance for extreme accuracy on Quality tests.
12. Easily adaptable to future tube developments.
13. Adjustable to varying power supply.
14. First English Reading condenser tester.
15. Accurately classifies all electrolytic condensers as "Good" or "Bad" on meter scale.
16. Neon test of all electrostatic condensers indicating leakages, shorts, or opens.
17. Uses full size neon lamp—easy to see instantaneous leakages.
18. Supreme 5" fan shaped meter, 1000 ohms per volt sensitivity.
19. Volt-Meter for point-to-point testing. 5 D. C. ranges of 0-5, 0-125, 0-500, and 0-1250 volts, 1000 ohms per volt.
20. Ohmmeter. Direct ranges of 0-2,000, 0-20,000 and 0-200,000 ohms, powered with self-contained flash light battery. Low range to 1 ohm with 35 ohms marking at center scale.
21. Megohmmeter. Direct ranges of 0-2 and 0-20 megs, SELF-CONTAINED power pack.
22. Single selector switch converts instrument to (1) English Reading tube tester, (2) neon tube leakage tester, (3) Neon Electrostatic condenser tester, (4) English Reading Electrolytic condenser analyzer, (5) Multirange voltmeter, (6) multirange ohmmeter, and (7) a double range megohmmeter.

KEEP YOUR SERVICE MODERN



AS RADIO DEVELOPMENT by equipping with RADICALLY NEW 1936 SUPREME INSTRUMENTS



Supreme 89 DeLuxe Tube Tester

$45.95

Dealers Net Cash Wholesale Price

Makeshift methods don't appeal to the radioman who insists on progressive, accurate equipment. He knows he must keep his service as modern as radio developments. An examination of the new 1936 Supreme Instruments convinces him that here is NEW equipment specifically engineered for the new phases of modern servicing—and that accommodations for the new octal tubes is but an incident in the line-up of engineering improvement contained in this always outstanding group. Even more pleasing to him is the new low level of prices for a new high standard of manufacture and testing superiorities.

At $45.95 the Supreme DeLuxe 89 Tube Tester is radio's greatest offering. Quality built in every detail—7 instruments in 1. 22 of its outstanding features are tabulated at left—but to really appreciate what it means in fast, skilled servicing, get your jobber to give you a demonstration.

SUPREME 339—STANDARD ANALYZER
A new Free Reference Point Analyzer—the most outstanding value in the low price field . . $29.95

TURNS INSTRUMENT INSIDE OUT

You can definitely know the "inside story" of the instrument you buy before you buy. Check off here the instrument or instruments you are interested in. Write your name and address on margin below and address to: Supreme Instruments Corp., Greenwood, Miss., and you will receive detailed, complete technical data. Written by engineers who have been servicemen and speak the serviceman's language—know what he needs for profitable production. No cost. No obligation. ☐ Supreme 89-DeLuxe Tube Tester. ☐ Supreme 89-Standard Tube Tester. ☐ Supreme 385-Automatic. ☐ Supreme 189-Signal Generator. ☐ Supreme 339-DeLuxe Analyzer. ☐ Supreme 339-Standard Analyzer. ☐ Supreme 391-P.A. Analyzer.

SUPREME 385—AUTOMATIC
A multi-unit instrument, combining features of 339—DeLuxe Analyzer and 89—DeLuxe Tube Tester, plus other flexibility features possible only through Supreme's exclusive uni-construction $77.95

I'LL SEND MY FIRST LESSON FREE

Here's Proof

It shows how EASY *it is to learn at home to fill a* GOOD JOB IN RADIO

Clip the coupon and mail it. I'm so sure that I can train you at home in your spare time for a good job in Radio that I'll send you my first lesson free. Examine it, read it, see how clear and easy it is to understand. Then you will know why many men with less than a grammar school education and no technical experience have become Radio Experts and earning two to three times their former pay as a result of my training.

Many Radio Experts Make $40, $60, $75 A Week

In less than 15 years, the Radio Industry has grown from a few million to hundreds of millions of dollars. Over 300,000 jobs have been created by this growth, and thousands more will be created by its continued development. Many men and young men with the right training—the kind of training I give you in the N. R. I. course—have stepped into Radio at two and three times their former salaries.

Get Ready Now for Jobs Like These

Broadcasting stations use engineers, operators, station managers and pay up to $5,000 a year. Manufacturers continually employ testers, inspectors, foremen, engineers, servicemen, buyers, for jobs paying up to $7,500 a year. Radio operators on ships enjoy life, see the world, with board and lodging free, and get good pay besides. Dealers and jobbers employ servicemen, salesmen, buyers, managers, and pay up to $100 a week. My book tells you about these and many other interesting Radio jobs.

Many Make $5, $10, $15 A Week Extra In Spare Time While Learning

The day you enroll I start sending you Extra Money Job Sheets, which quickly show you how to do Radio repair jobs common in most every neighborhood. Throughout your training, I send you information for servicing popular makes of sets! I give you plans and ideas that have made good spare time money—$200 to $1000 a year—for hundreds of fellows. My Course is famous as "the Course that pays for itself."

Television, Short Wave, Loud Speaker Systems Included

There's opportunity for you in Radio. Its future is certain. Television, short wave, loud speaker systems, police Radio, automobile Radio, aircraft Radio—in every branch, developments and improvements are taking place. Here is a real future for thousands and thousands of men who really know Radio—men with N. R. I. training. Get the training that opens the road to good pay and success.

You Get A Money-Back Agreement

I am so sure that N. R. I. can train you satisfactorily that I will agree in writing to refund every penny of your tuition if you are not satisfied with my Lesson and Instruction Service upon completion.

Free 64-Page Book of Facts

Mail the coupon now. In addition to the sample lesson, I send my book, "Rich Rewards in Radio." It tells you about the opportunities in Radio, tells you about my Course, what others who have taken it are doing and making. This offer is free to any ambitious fellow over 15 years old. Find out what Radio offers you without slightest obligation. ACT NOW! Mail coupon in an envelope, or paste on a 1c post card.

J. E. SMITH, President
National Radio Institute, Dept. 5HR
Washington, D. C.

Clears $4,500 in 18 Months

"Before taking your Radio Course I was making $18 a week. I came here three years ago and in 18 months I made about $4,500 in Radio. I cannot say too much for the wonderful help I have received from N. R. I."

NOEL W. RAY,
619 Broad St.,
Gladsden, Alabama.

Spare-Time Work Pays $18 A Week

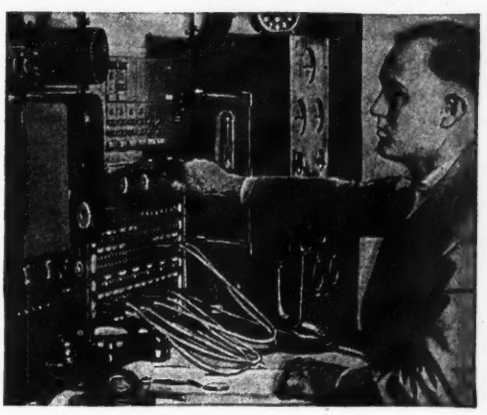
"I only do spare time Radio work and average $18 a week. People who in good times would buy a new Radio, now have the old one fixed."

STEPHEN J. DRAPCHATY,
407 Wunderlich Ave.,
Barberton, Ohio.

Radio Engineer at WSUI

"Upon graduating I accepted a job as serviceman, and within three weeks was made Service Manager. This job paid $40 to $50 a week. Eight months later I obtained a position as operator with Station KWCR through your Employment Department. Now I am Radio Engineer of WSUI."

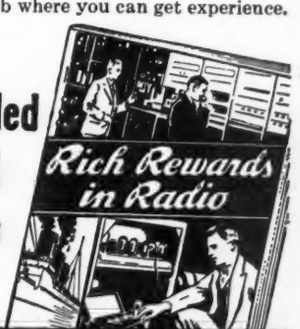
SYLVANUS J. EBERT,
University of Iowa,
Iowa City, Iowa.



You Get PRACTICAL Experience with Radio Equipment I GIVE You

I'll show you how to use my special Radio Equipment for conducting experiments and building circuits which illustrate important principles used in such well-known sets as Westinghouse, General Electric, Philco, R. C. A., Victor, Majestic and others. You work out with your own hands many of the things you read in my lesson books. This 50-50 method of training makes learning at home easy, interesting, fascinating, intensely practical. You learn how sets work, why they work, how to make them work when they are out of order. Training like this shows up in your pay envelope—when you graduate you have had training and experience—you're not simply looking for a job where you can get experience.

I have doubled and tripled the salaries of many



MAIL THIS NOW!

J. E. SMITH, President
National Radio Institute, Dept. 5HR
Washington, D. C

I want to take advantage of your offer. Without obligating me, send me your Free Sample Lesson and your book, "Rich Rewards in Radio."

(Please Print Plainly.)

NAME.....AGE.....

ADDRESS.....

CITY.....STATE....."R"

The Tested Way to BETTER PAY

RADIO NEWS

Edited by LAURENCE MARSHAM COCKADAY

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WILLIAM C. DORF, *Associate Editor*
JOHN M. BORST, *Technical Editor*
JOHN H. POTTS, *Assoc. Tech. Editor*
JOSEPH F. ODENBACH, *Art Editor*

Vol. XVII August, 1935 No. 2

Reading Guide to this Issue—

As a matter of convenience for those having specialized interests in the radio field, the following lists the articles and features in this issue, classified under 14 heads. The numbers correspond with the article numbers in the Table of Contents on this page:

Amateurs—4, 7, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 27, 32, 34.
Broadcast Fans—1, 2, 3, 4, 5, 6, 8, 9, 22, 28, 29, 30.
Dealers—1, 2, 4, 5, 8, 9, 11, 12, 13, 14, 25, 27, 31, 34.
Designers—3, 4, 7, 8, 9, 14, 29, 34.
DX Fans—5, 16, 17, 18, 19, 20, 21, 22, 28.
Engineers—4 6, 7, 14, 17, 18, 19, 20, 34.
Experimenters—5, 6, 9, 14, 16, 17, 18, 19, 20, 22, 23, 29, 32, 34.
Manufacturers—1, 2, 4, 6, 7, 14.
Operators—16, 25, 27, 33.
Servicemen—1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, 20, 22, 25, 27, 29, 31, 32, 34.
Set Builders—4, 5, 8, 9, 11, 13, 14, 17, 18, 19, 20, 22, 25, 27, 29, 34.
S. W. Fans—1, 2, 4, 6, 8, 16, 21, 22, 24, 25, 26, 27, 34.
Students—4, 6, 7, 14, 16, 17, 18, 19, 20, 22, 23, 32, 34.
Technicians—3, 6, 8, 9, 11, 13, 14, 17, 18, 19, 20, 29, 31, 32, 34.

Next Month—

Technical Descriptions and RADIO NEWS Listening-Post Test Reports covering some of the leading new receivers will be presented. The radio manufacturers' laboratories have been working overtime on new developments during the past year, with the result that some spectacular innovations are incorporated in receivers for the 1935-1936 season. RADIO NEWS feels that readers, whether or not they are in the market for new receivers, will want to keep posted on these new technical developments.

Published Monthly by Teck Publications, Inc., *Washington and South Avenues, Dunellen, N. J.*

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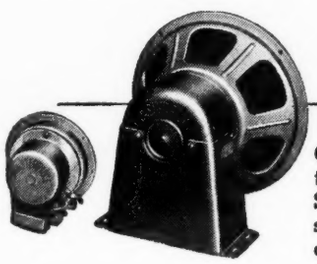
McMurdo Silver Announces

HIS LATEST AND GREATEST ACHIEVEMENT...

SILVER MASTERPIECE IV

The radio the world has been waiting for!

- NO INHERENT CIRCUIT NOISE
- CONTROLLABLE SELECTIVITY
- DOUBLE HIGH FIDELITY
- PROFESSIONAL FLEXIBILITY



Once more, McMurdo Silver renders distinguished service to radio. This time it's the Silver MASTERPIECE IV, a new model which sets a new standard, with a startling array of new "firsts" that will again be copied by other makers in the years to come.

Created out of the same genius which has produced more engineering developments in the past eleven years than all other American laboratories put together, the MASTERPIECE IV brings to radio a totally new concept of what truly round-the-world all-wave reception can be. Combined in the MASTERPIECE IV are 25 startling technical advancements and refinements, including

Freedom From Inherent Noise, permitting world-wide reception of stations so weak as to be entirely lost to other receivers.

Unmatched Selectivity, variable and eliminating interference to an extent heretofore unequalled.

Flexibility of Control, which for the first time brings to the ordinary listener the wide range control of performance demanded of professional receivers.

High Fidelity thruout the entire range, on distant as well as local stations.

21 Other Exclusive Features

And in addition — Silver MASTERPIECE IV brings you those important basic features which have won for its three predecessors the overwhelming acclaim of the most critical users, engineers, professionals and musicians.

In service throughout the world, Silver MASTERPIECES are delivering results utterly untouched by any other receivers. Already proven the champion of champions as a distance getter, the Silver MASTERPIECE IV brings you full-range high fidelity and tone quality so real, so thrilling, you will realize that here, at last, is the superlative musical instrument—the finest radio of all time. Mail the coupon TODAY for complete details.

10 DAY TRIAL

Prove to yourself that Silver MASTERPIECE IV is the finest radio of all time . . . by testing it in your own home, under your own reception conditions . . . entirely at our risk. Ask for details of amazing 10 DAY FREE TRIAL OFFER. Mail the coupon today!

▼ ▼ ▼

McMURDO SILVER CORPORATION Division of G.P.H., Inc.

3352 N. PAULINA STREET, CHICAGO, U. S. A.

Learn about the 25 New Features

The Silver MASTERPIECE IV introduces so many entirely new engineering features that they cannot even be summarized here. But, if you will mail the coupon below, we will gladly send you the completely descriptive and analytical 32-page "Blue Book"—a presentation of radio so perfected that it will be a revelation to you of what entirely unhampered engineering can accomplish.

MAIL COUPON FOR BOOK

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Send me full particulars of your 10 Day Trial Offer and complete specifications of Silver MASTERPIECE IV.

Name.....

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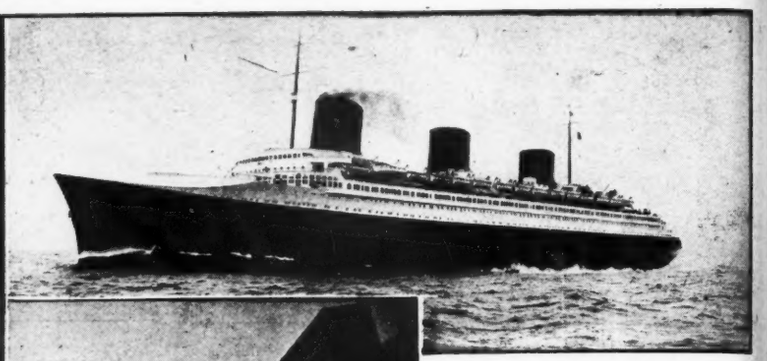
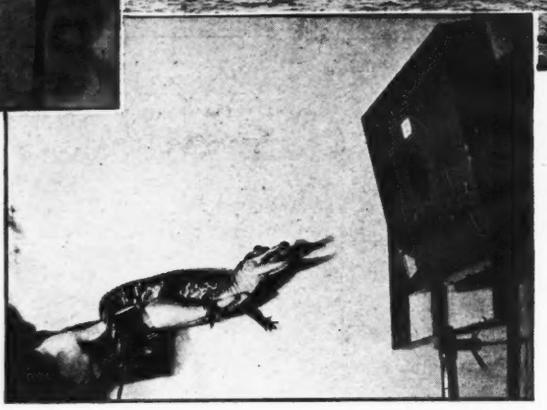
SRN

TELEVISION CREATES ANIMAL STARS

It seems as if the birds and beasts are beginning to have "their day" in broadcasting. Above: Capt. C. W. R. Knight and his famous golden eagle, and at right a baby alligator of the London Zoo take their place before the "mike" and the "electric eye."





THE S. S. NORMANDIE

World's largest steamship, besides creating great general interest on its visits to New York harbor is also interesting to radiomen for its marvelous radio installations, including the regular communication apparatus and directional radio "path-finder" and a complete broadcasting apparatus from which programs are sent to America.

DOTS • • • • • and — — — DASHES

Short but Interesting Items from the Month's Radio News the World Over

Television Will Cut Out "Visiting"—Is Prophecy

NEW YORK, N. Y.—Thomas Midgley, recipient of the William H. McNichols medal of the New York Section of the American Chemical Society recently, in a talk before that body prophesied that television would, one hundred years from now, end visiting and that people would call on their friends by this means entirely. Some of his other predictions were the development of chickens as big as pigs, the elimination of indigestion, dream pills that would allow a man to select just the kind of dream he wants by taking the right kind of pill, control of age, defensive chemistry to equalize the horrors of war chemistry, and the introduction of transplanetary travel.

Television Programs in Canada

MONTREAL, CANADA — Television programs transmitted on the ultra-short waves are now being received at distances up to 55 miles in the Montreal area from the new station of the Peck Television system. The first transmissions were carried out with a 60-line picture and work is being completed now on the installation of a new 180-line transmitter. This is claimed to be a record for distance for reception on waves from 5 to 7 meters.

Discovers 2,450,000 New Radio Homes in America

NEW YORK, N. Y.—In the first radio census of radio homes in the United States since 1930, Dr. Daniel Starch and his associates have uncovered 2,450,000 homes never before included in radio audience lists of the United States. This figure, in addition to the 4,000,000 sets sold in 1934, establishes a new high of 21,450,000 radio listeners in the U. S. Other interesting figures are: nearly 800,000 motor cars radio equipped in 1934 in this country; radio homes in the United States with two sets or more now 2,295,770; the largest group of listeners are those with an income between $2,000 and $3,000 a year, living in towns of under 1,000 population; the next largest group were farmers and the third largest group were people living in towns up to 25,000 population, with incomes running between $3,000 and $5,000 a year.

The Largest P. A. System Ever Built

SAN DIEGO, CAL.—The most extensive public address system ever installed on the Pacific Coast, with volume sufficient to blanket an area 10 miles square will be operated by the Associated Oil Company during the recent California Pacific International Exposition here. This elaborate system of sound amplification, which is similar to the facilities and services of a transcontinental radio chain, was used for dissemination of information, announcements and musical programs for the 5,000,000 visitors expected at the exposition. It directly contacted every garden, exhibit palace, canyon and mesa by the in-

REALIZES HIS AMBITION

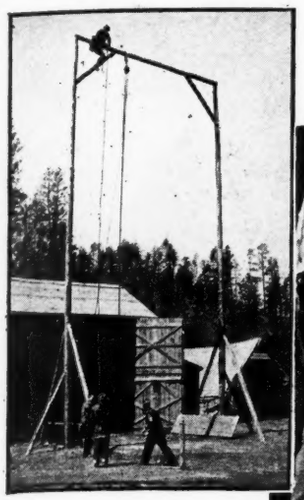
Ross Hull, pointing to W2XAF in Schenectady on the map of North America, shows how he realized a long-cherished wish to hold a two-way conversation with his brother in Sydney, Australia. With him is K. B. Warner, Secretary of the A.R.R.L. pointing to the Sydney location of VK2ME on the globe.

HE STUDIES SOUNDS WITH A TELEVISOR

Prof. Tonna-Barthet of Malta has developed this device to make sounds visible.

EVER LISTEN TO A BATTLE?

You could have done so during recent broadcasts of army manoeuvres, in Rome, when an officer attached to each detail broadcast the different actions taking place and explained their moves.

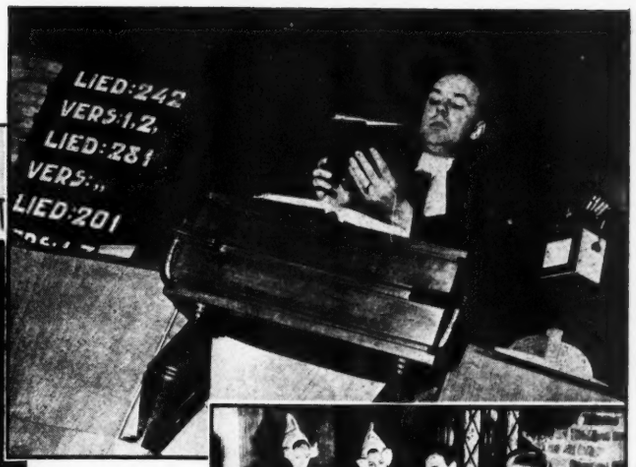


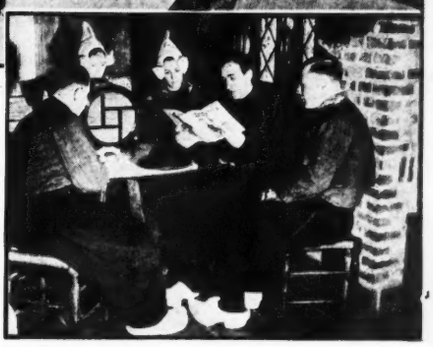
PREPARATIONS

Here are workmen preparing the scaffold for "hanging" the spherical gondola of the Explorer II in preparation for this year's stratosphere hop.

ALL READY TO GO!

Capt. A. W. Stevens, left, and Capt. R. P. Williams, after a final inspection of the gondola.





HOLLAND WORSHIPS AT HOME

The custom of going to church on Sundays has been practically abandoned and the devout now keep their ears to their loudspeakers, during services broadcast by radio. Above: a pastor broadcasting the Word of God and below: a family listens-in in their cottage.

stallation of 156 loudspeakers installed in the 300-acre fair district of beautiful Balboa park.

Mustn't Cuss on Short Waves, Fire-Fighters Are Warned

WASHINGTON, D. C.—Because of the large numbers of possible listeners-in on short-wave radio sets, Forest officers are finding it necessary sometimes to tone down their working vocabularies, even under the stress of battle with the flames. Strict orders against "cuss-words" in radio messages have been issued, the Forest Service revealed, in reporting that more than 600 radio stations have been installed for emergency communication in the national forests this summer.

Now that short wave receivers have become so popular, radio gives far less privacy than even the old-fashioned party telephone line, according to the Forest Service. Thousands of listeners are picking up the Forest Service messages, and occasionally getting a real insight into the many difficulties and problems foresters have to meet in quelling fires in the woods.

Ultra-High-Frequencies Used on Stratosphere Test

WASHINGTON, D. C.—The 1935 stratosphere ascent of the giant balloon "Explorer II," sponsored jointly by the U. S. Army Air Corps and the National Geographic Society, was equipped well in advance of the day of flight with the most modern radio apparatus available. Designed to meet the unusual requirements of an ascent above the atmospheric levels, the equipment was developed by Mr. Robert M. Morris, National Broadcasting Company engineer, and the instruments were made by the RCA Manufacturing Company.

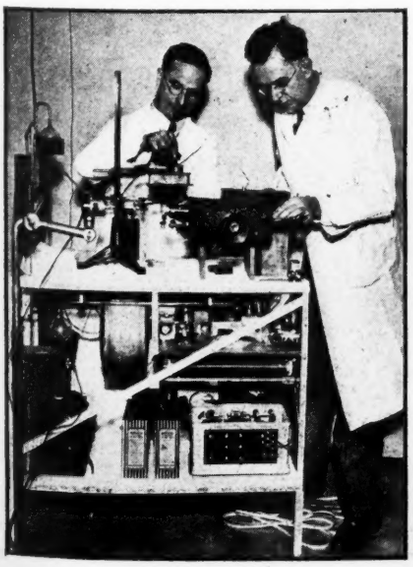
The voice transmitter, little larger than the miniature type home receiving set, was almost identical in construction with the one used in the previous year's stratosphere exploration of the "Explorer I." The transmitter functions on a frequency of 13,050 kilocycles, the wavelength equivalent of 23 meters. The receiving unit is a short-wave, single-control, superheterodyne set weighing but 15 pounds.

New Station in Peru

LIMA, PERU—A new broadcasting station, OAX4F, was inaugurated recently. The station is being operated by the radio firm of F. W. Castellano y Hermano and the equipment was set up by Senor Eduardo Rivero Saenz, a Peruvian engineer, graduate of an American University.

DEATH RAYS FROM SALT

Dr. Otto Glasser and his assistant, I. A. Beasley (left) shown producing bacteria-killing rays, from salt crystals previously exposed to X-rays and radium rays. These waves are similar to radio waves, the only difference being a shorter wavelength.



VARYING EMOTIONS SHOWN

If you will examine the faces of this peasant family of the town of Pochen, in the U.S.S.R., you will notice that their first radio program produced different emotions, some of pleasure amounting almost to hilarity, some of astonishment and some of wonder.

TELEVISION SETS *may be* RENTED!

TELEVISION RECEIVING SETS may be rented to the householder instead of being sold as are ordinary radio receivers, according to recent reports of plans being formed by the radio interests. It is felt by those who are developing and promoting television that anything which might tend to break down the large investment in commercial radio must be avoided. This does not mean that the radio companies controlling television patents do not see ready competition for broadcasts, but they definitely do not wish to open up television commercially to the detriment of existing radio.

THE plan, as tentatively developed, calls for a deposit for the delivery of the set and a monthly fee during the time it remains in the home. If the plan can be developed along price lines which will attract a large number of families, many of the pitfalls which have fettered television development will be removed. The rental fee system, although it is expected to aid the financial support of television broadcasting, will not do away with the selling of station time. It will, however, put the broadcasting companies in a position where they can dictate to a greater extent the type and length of commercial announcements. It would be natural, if one is paying a fee for television reception, that the broadcasting company would not overburden the "listener" with too much commercial propaganda.

HOW far these plans actually have gone is a question, but it is believed by those close to these companies that they would not have announced the plans for building up facilities for television broadcasts in the field unless they were ready to go ahead with a well-formed marketing proposition. If the sets are placed in the homes on a rental basis there will necessarily have to be service stations available throughout the country to service and repair the sets. This will open up a field of new endeavor for servicemen. It will perhaps give the local radio service shop a chance to become the official or authorized agent for the television manufacturer. It is understood that plans for maintaining television sets are not complete, and it may be that the radio companies will make it necessary for the lessee to maintain the set and in return pay a lower rental fee for the same.

TELEVISION was discussed at a recent meeting of the Motion Picture Engineers, in Los Angeles, and it developed that there is little possibility of television being perfected in the immediate future to the point where motion-picture reels will be broadcast to remote theatres for reproduction on the screen and through the regular sound apparatus. It was also the consensus of opinion among these engineers that the motion-picture industry *should not furnish films for television broadcasts,* in that moving pictures by television in the home would result in direct competition with the motion-picture house, no matter how carefully presented as to style and content.

Radio News

August, 1935

WORLD'S LARGEST ALL-WAVE SET

That international short-wave broadcast programs have a definite interest for the average listener is evidenced by the fact that one of America's largest hostelries has recently incorporated short-wave reception in its lobby and 2,000 guest rooms. A description of the great receiver, which undoubtedly will be duplicated in other institutions, points out its many interesting features

L. M. Cockaday

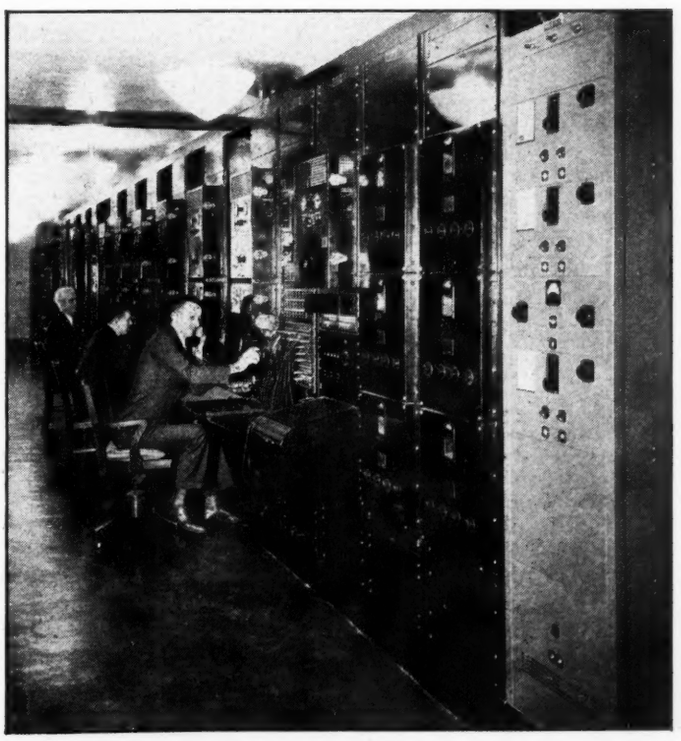
THE thrills of all-wave listening are no longer a novelty. The great enjoyment of tuning-in the world in your own home is now a commonplace. So much so, as a matter of fact, that fans are bound to miss the universal program fare when away from home on business or pleasure trips. There is now an indication that leading hotels throughout the land, in cognizance of the all-wave radio trend, may follow the suit of the famous Hotel Waldorf-Astoria, of New York, in converting centralized radio systems into all-wave program relay plants.

2000 Loudspeakers

What is claimed to be the world's largest all-wave radio receiver has been installed in the Waldorf-Astoria by the Western Electric Company. The gigantic receiver supplants the centralized broadcast band unit previously used at the skyscraper hostelry. The new equipment makes available to 2,000 guest rooms, as well as lobbies, ballrooms and restaurants, the short-wave offerings of stations in England, France, Germany, Russia, Japan, Italy, Africa, South America—virtually all parts of the globe.

THE WALDORF'S 50-FOOT ALL-WAVE RECEIVER

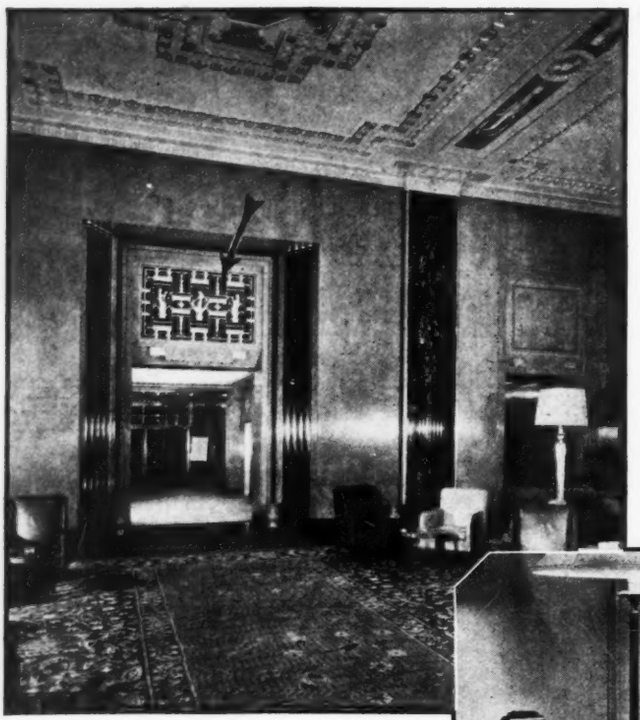
This is the radio room of the Waldorf-Astoria Hotel, New York City, showing the extensive array of equipment in the hotel's all-wave receiving and distributing system, where H. R. Martin, superintendent of communications, in the foreground, and two radio operators, H. D. Schwartz and J. Stevens, are shown tuning and routing programs.



Previously, the Waldorf's radio system covered only the standard broadcast band of 550 to 1500 kilocycles. The new equipment adds the band of 2200 to 25,000 kilocycles. In addition to foreign presentations, such items as police, aviation, Government and amateur signals can be tuned in for the entertainment of the hotel's guests. It is the management's claim that it is the first hostelry in the United States to install such a system. The move was prompted by the international flavor of its clientele and its many foreign guests.

Six Channels

The radio receiving and amplifying panels of this huge receiver at the Waldorf are 50 feet long. The distributing network covers the entire structure. Up to the time of the addition of the short-wave apparatus, the hotel made available six programs composed chiefly of broadcast presentations, but also including electrical transcriptions and public events going on within the structure. Now the new equipment makes possible the inclusion of foreign programs. The day's programs of short-wave stations all over the world are examined by the hotel's radio staff and the most



IN THE LOBBY

At left: The grill work behind which are the loudspeakers for bringing programs to guests in the lounging rooms.

A GUEST ROOM

Below: An individual loudspeaker, set up for the enjoyment of guests in each room. The right-hand knob controls volume, and the left-hand knob selects programs.

interesting items are selected and published in the hotel's house organ as the guests' tuning guide.

A novel antenna system, especially designed by the Bell Telephone Laboratories for the peculiar needs of the hotel has been installed. It is a predominantly horizontal aerial designed to combine efficiency and protection from interference. Three strands of wire were strung between the two towers, 660 feet above the street, in an unusual array. Two of the wires are crossed to form an X while the third resembles an inverted U. The lead-in wire is attached to the intersections of these strands and is stretched vertically down to the roof. Precise calculations in the arrangement and length of the wires are said to assure a constant selection of choice short-wave features.

The Antenna System

Each of the antenna wires is of different length to respond most powerfully to waves having related wavelengths. For example, one of the wires is 78 feet long, for 25 meters. This wire will respond with particular intensity to waves twice its length, or 50 meters. This is the wavelength of a transmitter on 6000 kilocycles. The same strand also responds to waves produced by odd multiples of this frequency, such as 18,000 kilocycles. A second wire responds to 12,000 kilocycles. The third responds to 3000, 9000, 15,000 and 21,000 kilocycles.

This span of frequencies includes the bands which contain the world's most famous short-wave stations. The antennas also respond to adjacent bands.

It was pointed out that the new antenna eludes the vast amount of man-made static which, in such a metropolis as New York, arises from countless electrical sources. It was asserted that interference originating nearby presents a vertical front and the new type horizontal antenna is immune to them.

Interference had to be calculated with great care. The location of the Waldorf-Astoria Hotel seemingly presents many problems from this angle. On the Park Avenue side, the New York Central and New Haven Railroad trains pass by underground. On the Lexington Avenue side, there is a two-level subway and a surface car line. The side streets, Forty-ninth and Fiftieth, have a bus-line going in either direction. All this, remember, is in addition to the vast amount of automobile traffic on all sides.

But modern equipment and engineering methods still succeed in routing world-wide short-wave programs to the hotel's guests.

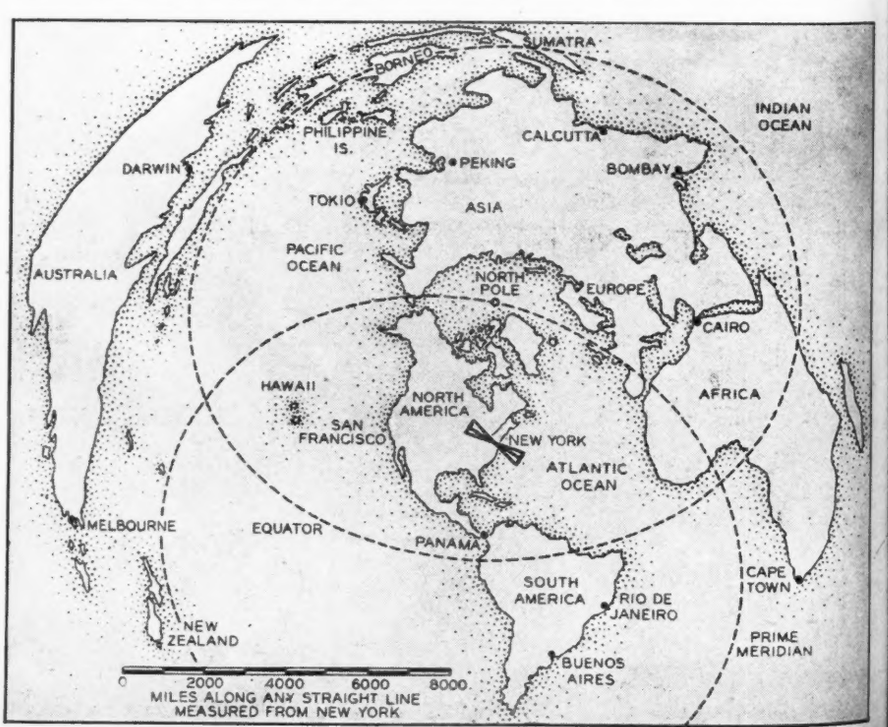
Receiving Equipment

The radio room is on the sixth floor of the structure. A special transmission line conveys the impulses down 600 feet without electrical loss and with complete protection from interference.

Short-wave receiving equipment utilized in the hotel is somewhat similar in design to the commercial apparatus at the international Bell System stations at Netcong, New Jersey, and Miami, Florida. Ship-to-shore telephone services also employ such types of apparatus. Thus, the hotel guests have the advantage of such a refinement as overcoming sudden fading by automatically increasing amplification to maintain a constant volume.

Outlets for the radio service in each room accommodate special receiving units with program selectors and volume controls. The units are rented to guests on a daily, weekly or monthly basis for a moderate fee.

A prominent feature of the Waldorf-Astoria receiving units is their high degree of selectivity. The circuits at one point are tuned by six condensers which function (*Turn to page* 117)

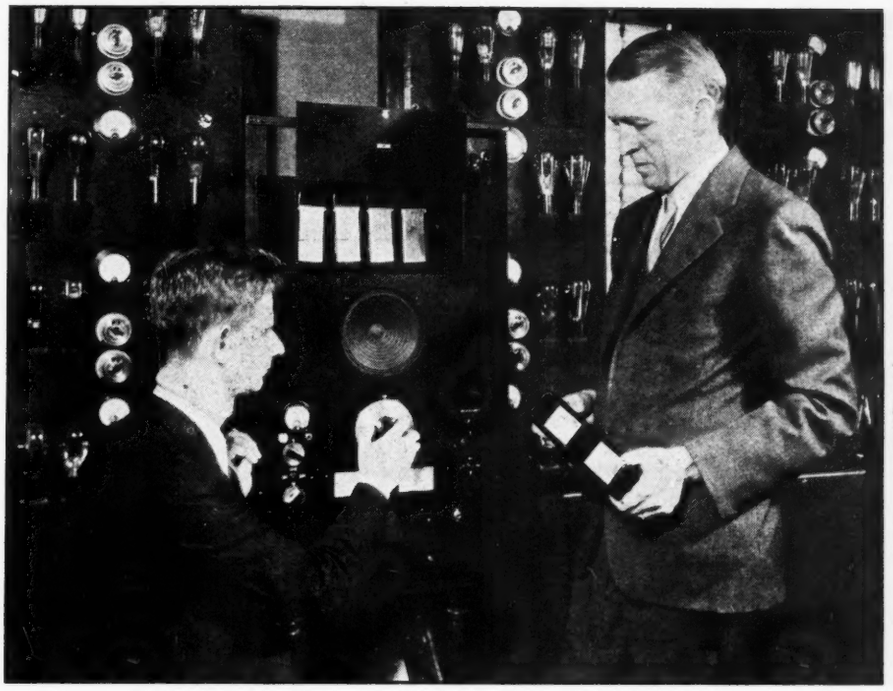


HOW ANTENNAS ARE DIRECTED

Azimuthal map of the world, showing coverage of the principal continents by the Waldorf's new-type antenna system. The fields include Europe, Asia, a large part of Africa, and all of North, Central, and South America.

WHAT'S *NEW in* RADIO

By William C. Dorf

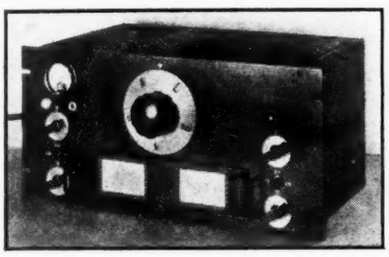


SEEN AT THE TENTH AMATEUR CONVENTION

One of the features of the Show and Hamfest of the Hudson Division, A.R.R.L., held recently at the Hotel New Yorker, was the Rack-and-Panel mounted National HRO Amateur Communication receiver. Photo shows J. M. Borst and Wm. C. Dorf of RADIO NEWS *Staff testing it in the Hotel's radio room*

Communication Receiver

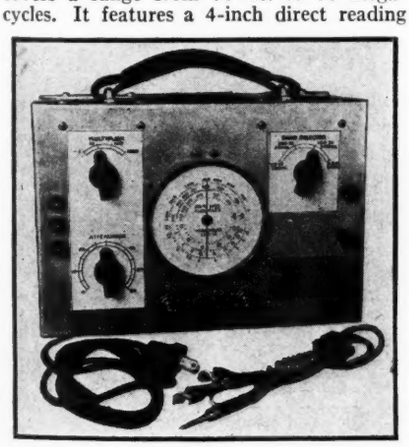
The photograph below illustrates the new National Model HRO communication receiver for rack mounting. It employs nine tubes, is equipped with 4 plug-in coil assemblies, individually shielded, to cover all frequencies between 1.7 and 30 megacycles, has continuous band-spread with a



precision-ganged condenser with new micrometer dial, single-signal (crystal-filter) operation, and incorporates many other unusual developments. It is designed to meet the exacting demands of the more advanced communication services.

Four-Control Signal Generator

This Supreme model 189 signal generator employs an electron-coupled circuit and covers a range from 90 kc. to 30 megacycles. It features a 4-inch direct reading



airplane type dial with a 10 to 1 ratio and ladder attenuator, and is equipped with a self-contained 400 cycle modulator.

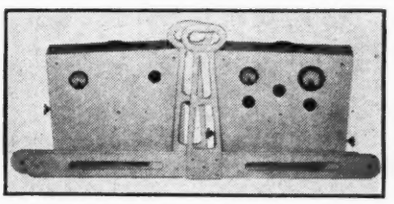
Something New In Headphones

The Brush Development Company, manufacturers of the piezo-electric microphone and phonograph pick-up, is now producing piezo-electric (crystal) headphones. The new phones are of high impedance and feature unusually good tone quality and the ability to stand strong signals without blasting. Although very sensitive, the manufacturer advises that the power requirement for the new headphones is but

a fraction of that required to operate ordinary electro-magnetic type phones. They are designed to have a response from 60 to 10,000 cycles.

Attention! Treasure Seekers

A new, portable geophysical instrument called the "Terrometer" for detecting the presence of electrically conductive ore beds and metallic deposits which are buried at



moderate depths beneath the earth's surface, is announced by William M. Barrett, Inc. The instrument consists essentially of a high-frequency oscillator and a sensitive detector, maintained in rigid alignment by supporting arms and provided with carrying handles for manual transportation. The instrument is equipped with a rugged pointer-type galvanometer. The manufacture and distribution of the "Terrometer" is under the direction of the Engineering Research Corporation.

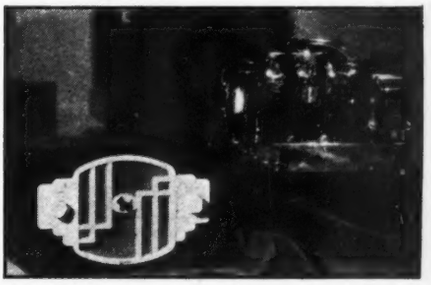
Dynamic Microphone

The Radio Receptor series "6" dynamic microphone has been designed for wide frequency response, ruggedness, high sen-

sitivity and noiseless operation. Additional features include wide-angle pickup and compact size, and it has been constructed to be blast proof and weatherproof.

Compact Radio for the Home, Auto or Boat

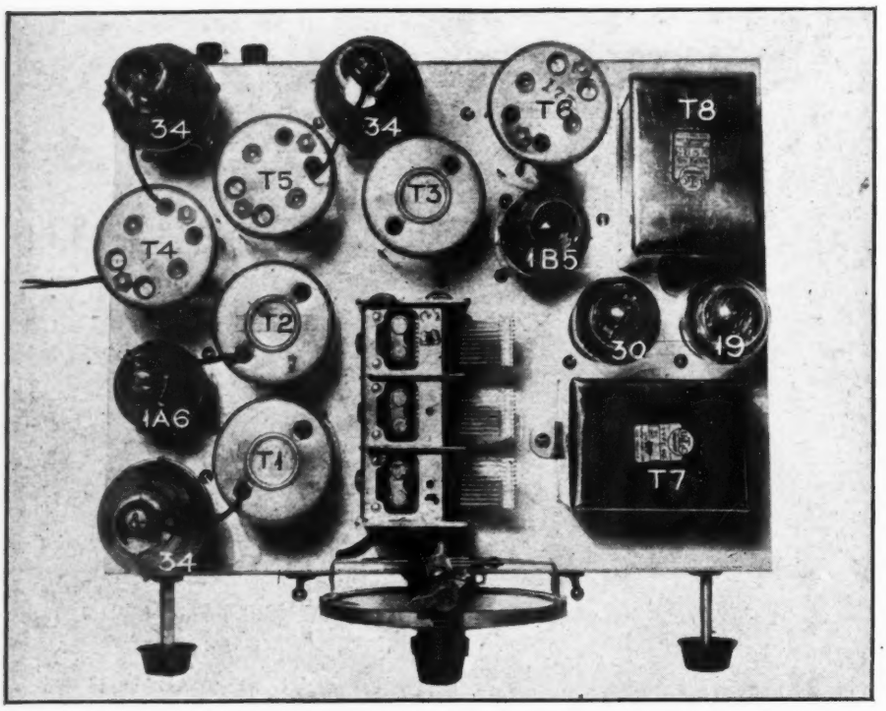
The Remler model 27, 6-tube universal set designed to operate from either a.c. or



d.c. lighting lines or battery supply, has a wavelength range from 175 to 556 meters.

(*Turn to page* 106)

For Your Rural Home Camp or Cabin DX Corner You'll



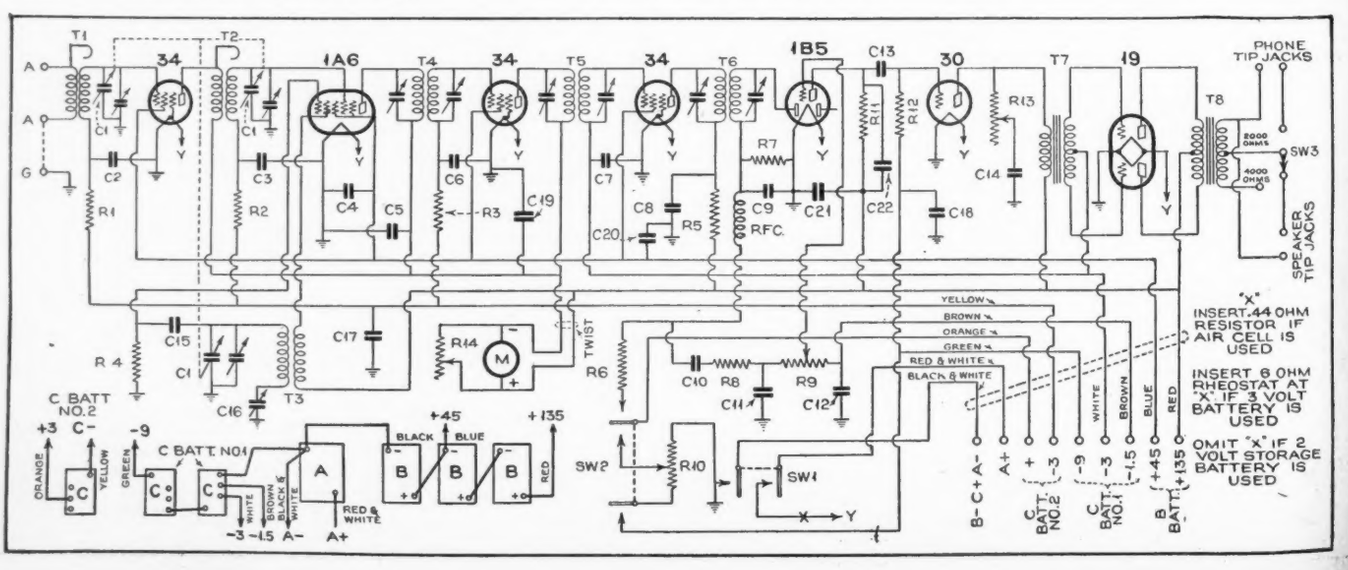
S. Gordon Taylor

THIS is the receiver for you, if you live out in the country, where you must depend on battery power—or if you are one of the many city dwellers who feel that battery operation provides the low noise level required in long-distance (DX) reception. If you have a moderate knowledge of radio construction you can build this set yourself, or your local serviceman can do it for you. You will find results comparable with those of a fine line-operated receiver—and a combination of features found in no standard commercial receiver today, to our knowledge.

THIS new battery-operated receiver design incorporates an unusual combination of features which are outlined in the following paragraphs. The set contains:

1. Both automatic and manual gain control.
2. A signal strength and tuning meter providing a deflection of over 2 inches on strong local signals, and so sensitive that deflection of nearly ½ inch is obtained on the weakest signals.
3. A headphone-speaker switch which permits either of these units to be switched in, automatically cutting out the other; and with both headphones and speaker connected to an output transformer, preventing shock and d.c. overload.
4. A tone-control knob on the front panel which permits drastic attenuation of the high frequencies, thus materially improving the signal-to-noise ratio when trying for weak signals.
5. Full battery operation, eliminating all line noise.
6. Three dual-purpose tubes included (1A6, 1B5 and 19), thus permitting seven tubes to perform the functions of ten.
7. Absolute single-control tuning with airplane dial.
8. Frequency range wide enough to include the high-fidelity channels at 1530 and 1550 kc.
9. Ample loudspeaker volume to fill a good-size room, even on distant stations.
10. Sensitivity and selectivity to gladden the heart of the most critical DX'er.

In actual operation in New York City, using a 100-foot antenna, this receiver has succeeded in bringing in the New Orleans and Shreveport stations on 50 kc., with the local WABC, 860 kc., going full blast, and causing only slight interference. WLW was brought in with no interference from the local WOR, and Chicago stations were easily tuned in without interference from locals on adjacent channels. In fact, on the whole dial, during this test, the only instance where a local station interfered with a distant station on an



Want to Build this BATTERY "SUPER"

¶ The "RADIO NEWS 2-Volt DX'ers Super" is presented herewith; a design conceived in the interests of—and dedicated to—the rural listener and the DX'er

adjacent channel was in the case of WABC interfering with the New Orleans stations, as mentioned—and even this interference was experienced only part of the time.

It is difficult to give examples indicating the sensitivity because the final model was not completed until the latter part of May, at which time real DX reception was out of the question. Perhaps the best illustration of this quality is found in the fact that when set up side by side with two much larger and more powerful commercial receivers, this little job brought in every distant station heard with either of the other two—and brought them in with less noise. This in itself is quite an accomplishment, considering the fact that the commercial receivers employed in this test are both widely recognized for their unusual sensitivity.

Another proof of its sensitivity was found when, hastily running through its range, stations popped in on 94 of the 99 broadcast channels. This was accomplished at 11:00 p.m. on June 3rd, a poor DX night.

Signal-Strength Meter

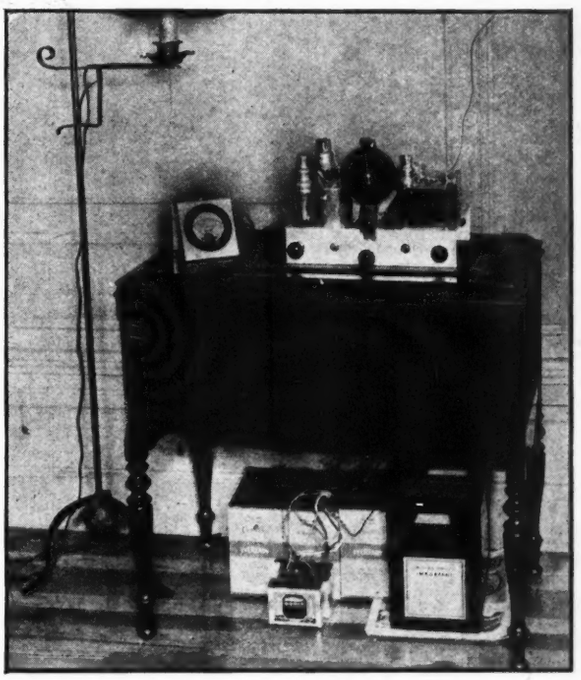
A tuning meter is important in any highly selective receiver. However, the small tuning meters employed in commercial receivers fall far short of the ideal. The one employed with the R. N. 2-volt DX'ers Super overcomes the obstacles of the ordinary tuning meter and is one of inestimable value to the DX'er. In the first place, in order to spread out the scale, a standard milliammeter is employed. Then to take fullest advantage of this wide scale, an adjustable shunt, R14, is connected across the meter so that full-scale deflection, with no signal tuned in, is obtained. This permits of maximum retardation when signals are tuned in. When the meter is connected to the receiver and with no signals tuned in, or the antenna disconnected, the shunt rheostat is adjusted until the meter reads full scale. Thereafter each station tuned in will cause the meter to retard more or less, depending on the strength of the signal. During the tests of this receiver, powerful local stations caused the needle to swing approximately 2 inches, and so great is the meter sensitivity that the weakest signal that could be heard on headphones caused the meter to retard nearly half an inch. With such wide variations as these, the meter serves not only as a tuning meter but, more important still, as a direct indicator of signal strengths.

In view of the fact that the tubes drawing their plate current through this meter have a total drain of only about 2.5 ma., it is necessary that the meter range be less than this value. For this reason a meter having a range of 0-1 ma. was employed. This meter could have been mounted in the receiver, but it was considered more convenient to use it externally. The meter and its shunt rheostat were, therefore, mounted on a strip of aluminum, bent to convenient shape and connected to receiver by means of a pair of twisted flexible wires.

The automatic volume-control system is worthy of special mention. As will be noted from the circuit diagram, this system automatically controls the sensitivity of the first three tubes. By so doing, it holds the volume of all stations, local and distant, at a substantially constant level. What is equally important, it absolutely prevents overloading even on powerful locals.

An outstanding feature of a.v.c. as applied to this receiver lies in the fact that it can be cut out when so desired merely by flipping a switch on the front panel. This provision was made for the benefit of DX'ers who prefer not to have automatic sensitivity control when tuning for very weak signals, especially when they are subject to adjacent channel interference. When the switch is set in the non-a.v.c. position, sensitivity is controlled manually by means of the left-hand knob on the panel. When set in the a.v.c. position, this manual-control circuit is completely cut out, making sensitivity control entirely automatic. In either position, loudspeaker or headphone volume can be controlled by means of the audio volume-control knob at the extreme right. This feature of allowing the a.v.c. to be cut out when desired is one which is found in no commercial receiver except two or three specials in the high-priced range.

Two-volt tubes are used throughout the receiver so as allow the greatest possible flexibility in the matter of filament power supply. For this purpose, an Air Cell battery serves admirably and, with the receiver in use an average of three hours a day, an Air Cell will last approximately ten months. Used an average of two hours a day, the life of this battery will be in excess of one year. If preferred, (*Turn to page* 123)

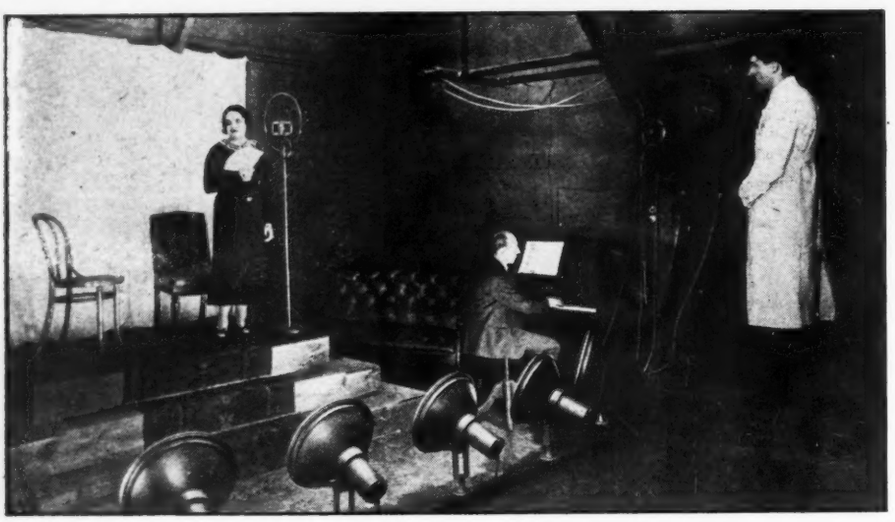


ONE OF THE TEST INSTALLATIONS

In testing the selectivity of the new receiver it was installed, as shown here, in the Broadcast Band Listening Post, New York City, where interstation interference offers a really severe problem. The results are described in the text. At the left of the receiver is the external tuning meter in its home-made stand.

Using Cathode Rays

By **Samuel Kaufman**

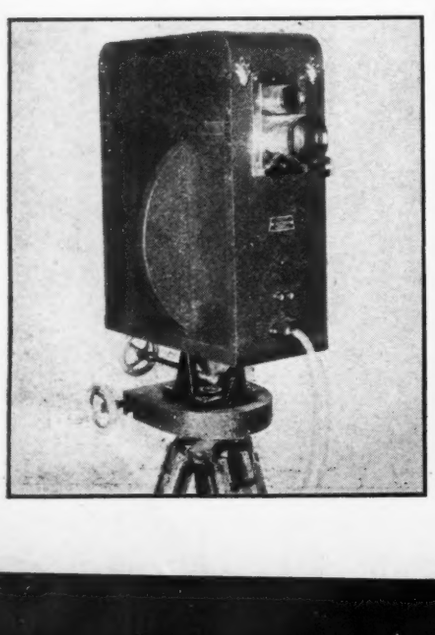


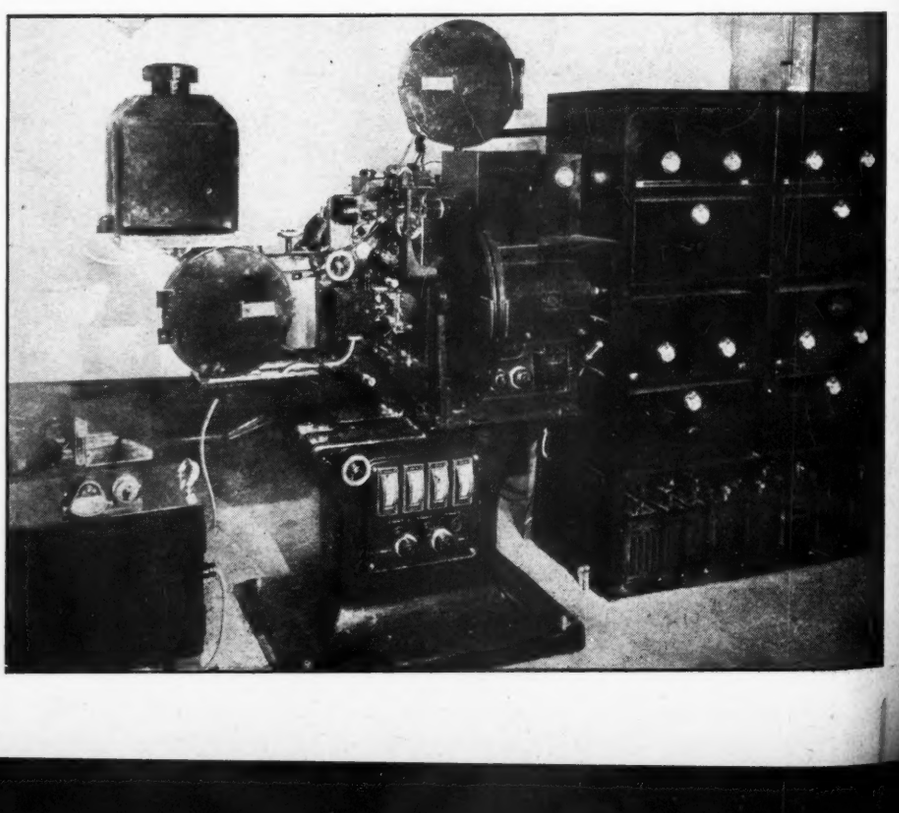
ADDED impetus has been given to the acceptance of the cathode-ray tube for future television development as another new television system, the work of M. Barthelemy, is announced. The apparatus is being utilized to achieve efficient and practical results in high-definition sight broadcasting. Although M. Barthelemy and associate engineers showed no indication of rushing their job, no time has been lost in getting the service started and a working schedule arranged whereby, in easy stages, the high-definition service is assured the public.

This whole new plan is a part of the national television development worked out by M. Georges Mandel, Minister of P.T.T. (Posts, Telegraphs and Telephones) for France, and the Barthelemy cathode-ray apparatus was chosen by

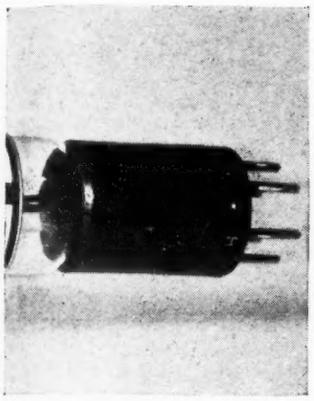
TELEVISION HIGH-LIGHTS

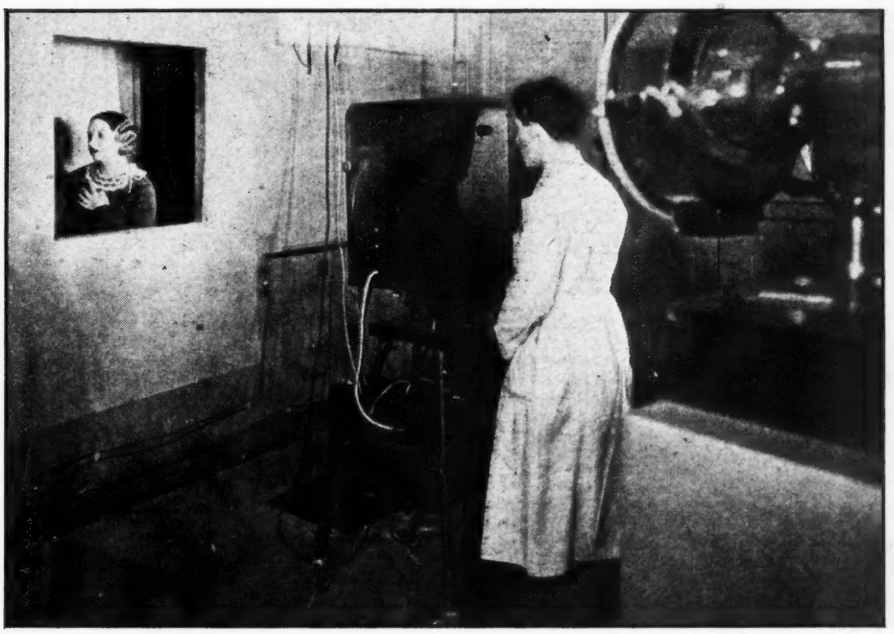
At top: The inventor of the receiving apparatus, M. Barthelemy. Directly above: Making a television "shot." Below: The television camera. At right: The transmitting apparatus employed at the station.





for High-Definition TELEVISION





SHOOTING A CLOSE-UP DURING THE FIRST BROADCAST

the Government experts. The launching of the service last spring brought reports that imports of television products into France would rise. But now, French manufacturers indicate that they are seeking licenses to produce types of television apparatus for sale in America and elsewhere pending the development of equipment of domestic design here.

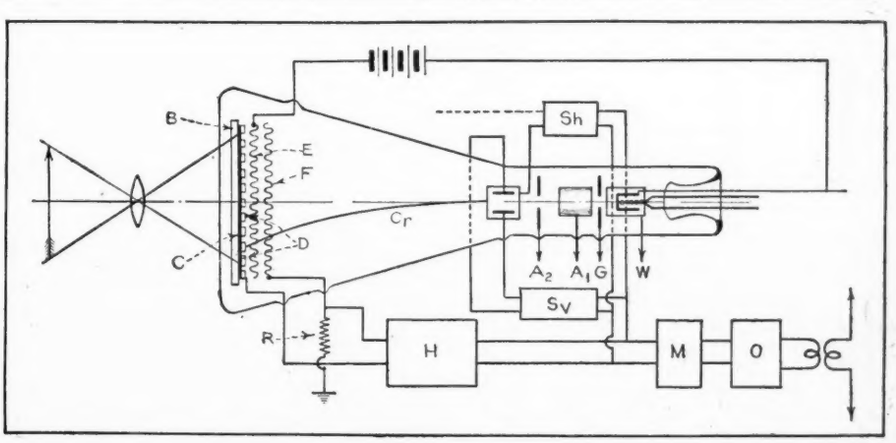
As the initial step in its home television program, Paris P.T.T. first presented 60-line images on the 175-meter channel. A picture frequency of 25 per second was maintained at the beginning, while at a subsequent date, 90-line images were to go out over the same wavelength. And now, in 1935, a 7-meter transmitter yielding 180 and 240-line pictures has been put into service.

The French radio manufacturers association, at the start of the 175-meter television service, issued a strong warning that television should not be taken too seriously. The association pointed out that low-definition services are "out-of-date" and represent systems discovered and available several years ago. The point was made that the early French television transmissions were conducted merely to aid the radio makers to prepare plans for future production. However, the launching of the 175-meter service, together with the assurance of high-definition transmissions has brought forth considerable enthusiasm from the radio public.

Latest TELEVISION INVENTION

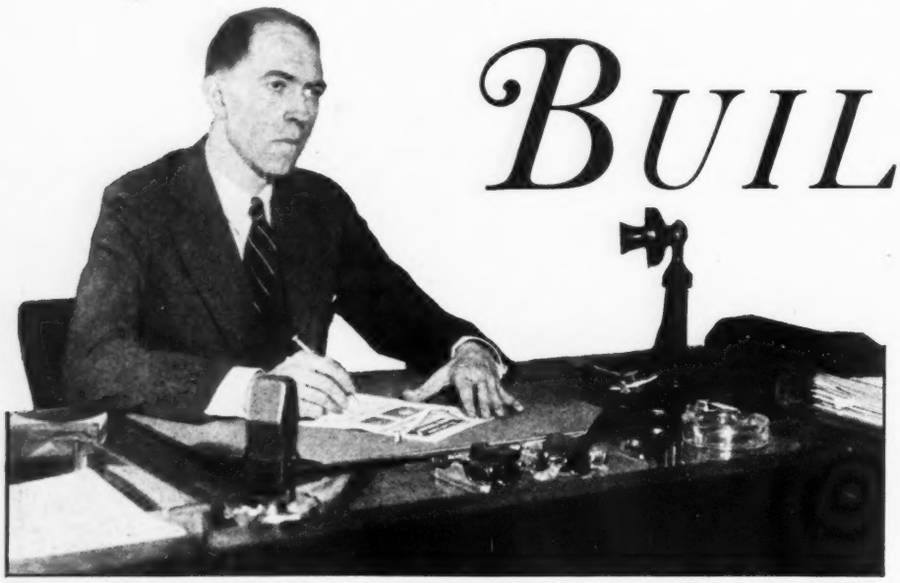
By Victor A. Babits

THE cathode-ray tube, the construction of which is now reaching perfection, has led the development of television into a new direction. The works of M. Ardenne, Campbell-Swinton, Farnsworth, Sabbah, and Zworykin referring to this subject are discussed at several places within recent television literature. A new system of television-transmitter-device, the essential part of which is a cathode-ray tube, is shown diagramatically in Figure 1. In this new system I have devised, the picture to be transmitted is reproduced on the transparent metal electrode C, this having been coated onto the quartz-plate *B* by cathode evaporization. A granulated blocking layer *D* is applied onto the electrode by a special procedure. Two electrodes *E* and *F* being made out of a dense metal net and being supplied with large surfaces, are placed parallel to the above-mentioned plane. We connect the electrodes *F* and *C* to a relatively high resistance *R*. Theoretically the layers *C* and *D* form a great lot of photo-electric elements being connected parallel, for the light beam, which passes the quartz-plate *B* and the transparent metal electrode *C*, brings (*Turn to page* 107)



NEW TELEVISION CIRCUIT
Here is a diagram of the unique Babits special cathode-ray television circuit.

A. J. Haynes, Authority on Radio *BUILDING*



¶ *"It's custom built", "I had it built specially for me", "It's a special job" —Psychology and pride of possession go to work for the serviceman who takes advantage of this opportunity which has suddenly arisen in this profitable and interesting new radio field.*

RECENT technical developments in radio apparatus have made it possible for the serviceman to offer his customers the most advanced type of custom-built all-wave receiver at a very attractive price that still leaves a nice margin of profit for himself.

A new type of tuning unit which makes advanced superheterodyne construction practicable for the serviceman, is the recent development responsible for this new opportunity. By utilizing this prealigned and wired tuner he can offer his customers an all-wave job capable of the very finest reception and at the same time meet their special installation requirements. The Browning 35 receiver, recently described in RADIO NEWS, was built around this tuner and is an excellent example of the very fine results which can be accomplished with it.

Suppose we briefly analyze the situation and see just what the serviceman has to offer his customers in the way of a custom-built radio installation designed especially for his own individual home. There are a few outstanding factors concerned in the sale of *any* radio receiver. We can list them about as follows, *not* in the order of their importance, as this varies widely:

1. Name (reputation, advertising, etc.)
2. Price.
3. Performance.
4. Appearance.

NUMBER ONE, the maker's name and reputation is a powerful factor in any merchandising. The individual radio serviceman does not have a background of national advertising and publicity, it is true, but, in his small sphere of business where he makes *personal* contacts, he should be able to sell himself and his work by personality, salesmanship and local reputation.

NUMBER TWO is the price question. Here the serviceman is "sitting pretty." In the first place, his competition is very small. In the case of the more expensive and exclusive, really high-class radio receivers—and this is the competition we are concerned with —the market is anything but overcrowded and the few sets of this type which are offered are usually very expensive. The serviceman *can* build this class of receiver and sell it profitably at a reasonable price.

NUMBER THREE is performance. Let us examine this factor a little more thoroughly, as here is where the added value should be found which distinguishes the fine receiver from the "just ordinary" run of sets and justifies its higher price. Merchandising radio is much the same as other kinds of selling. There are a few buyers who just naturally understand and appreciate the performance of a fine receiver (or automobile or vacuum cleaner, as the case may be), while there are many more who can be made to see the advantages offered by the better job if they are given a clear and simple explanation and demonstration—that is, they can be sold. It would be well to fix in our minds the distinguishing points of performance of a fine radio set. A first-class all-wave receiver should frame up about as follows:

1. It *should* cover the entire frequency band from 550 kc. up to the highest short-wave frequency (21,540 kilocycles.)

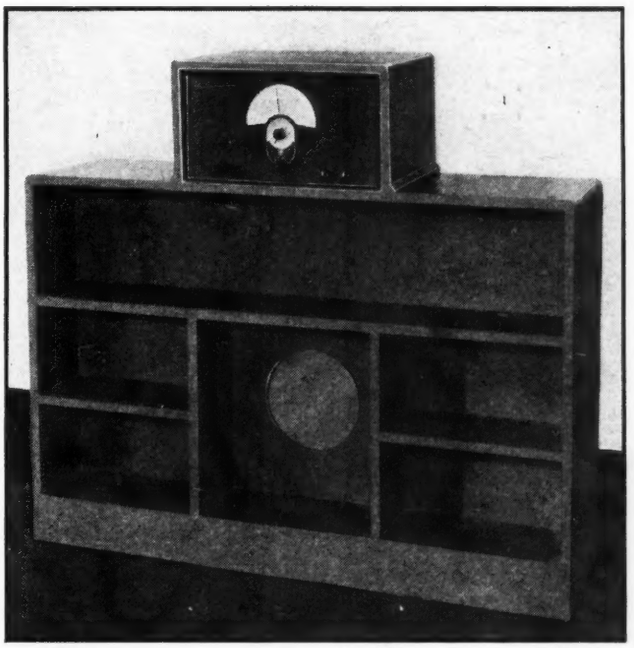
2. It *should* have a mechanically sound tuning system with continuous band spread or vernier tuning *which can be logged.*

3. It *must* have adequate selectivity, but *not too much!* It *should* be able to separate stations which are not heterodyning badly but *should not* have such a sharply peaked over-all selectivity curve that the tone quality is destroyed. This calls for a pretty nice balance in engineering design. Beware of resonance curves with sharp peaks but broad bases. Such a curve produces neither tone quality nor selectivity. The high, sharp peak is of little use when the lower amplication of the broad base is still sufficient to bring through an adjacent powerful signal.

4. The receiver *should* deliver the lowest possible noise-to-signal ratio. For long-distance reception this is the most vital factor of all. It is too involved a subject for discussion here, but in general the following points might be considered: *Efficient* preamplification helps tremendously. The proper circuit design, coupling characteristics and voltages in the first detector and oscillator *are very important!* Do not use more i.f. amplification than necessary to attain adequate selectivity and sensitivity—ultra-powerful and sensitive receivers often are impractical in long-distance reception. A receiver with the minimum necessary number of tubes, working at full efficiency (not overloading, however) is usually to be preferred. The second detector *should* be a diode or some similar form of *linear* rectification. The average audio amplifier today is quite satisfactory and contributes little or no noise of its own.

Merchandising *Plans this Idea for*

Service Income



This may mean Dollars to YOU

5. Good reproduction *is* essential. After all, our receiver is a reproducing instrument and it cannot be exhibited (with pride) or even listened to (with personal satisfaction) if it is not giving a faithful performance; and here the serviceman *is not only in a favorable position, but has an exclusive field!* He realizes—if the public does not—that the final reproduction from any radio set depends, to a large extent, upon the manner in which the reproducing mechanism—that is, the loudspeaker—is installed, and he knows that it deserves much greater care and consideration than is commonly accorded to it.

Here is where the ingenious radio serviceman has a real chance to spread his wings and build a reputation for himself. Now that he can equal high-priced radio sets on the other points of performance, this fifth point *offers him the opportunity to forge far ahead!* He is not limited to hollow, resonant cabinets with inadequate, flimsy baffles. Shipping weight is no limitation to him. He does not have to consider the ethical appeal of the radio as a piece of furniture to the *average* housewife. And this brings us to—

NUMBER FOUR—Appearance. While each installation must satisfy the artistic requirements of its specific purchaser (and his family), the serviceman can obtain a very definite knowledge of these requirements and limitations. It should be his place to suggest ways and means whereby the radio can be *built into the home* in such a manner that it will give the *greatest possible satisfaction,* both from a utilitarian and artistic standpoint. Show the customer the type of reproduction which is possible with a special custom job and a *good* speaker baffle, and he is never again going to feel satisfied with a "just ordinary" cabinet set.

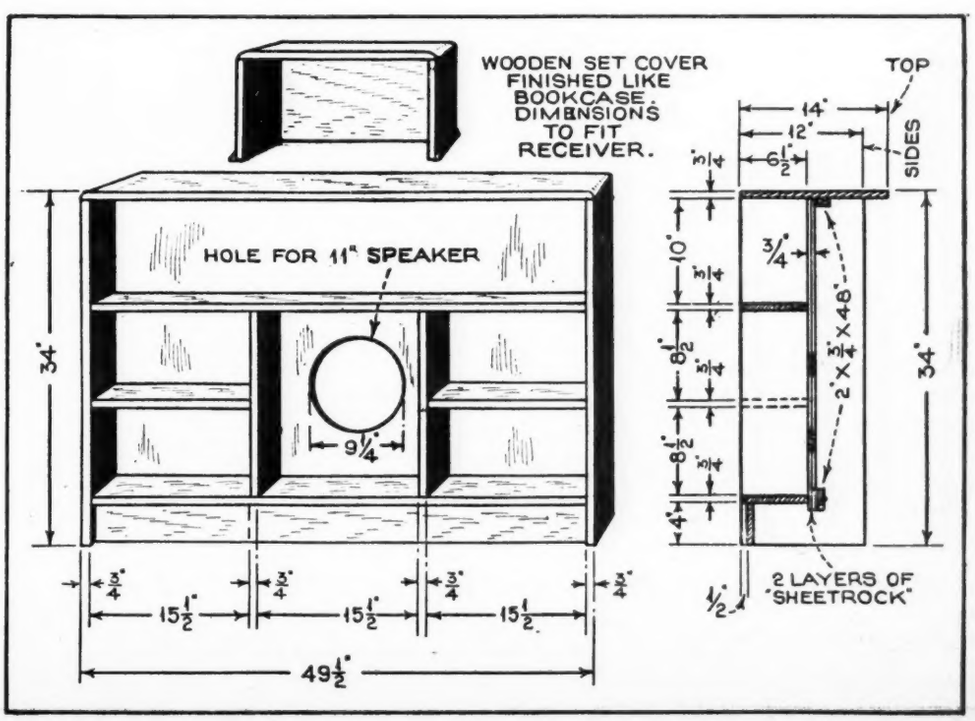
The problem of the speaker itself is not different. There are many satisfactory ones on the market and, while price is usually a good index of their worth, even the less expensive ones deliver surprisingly good results if *properly mounted.*

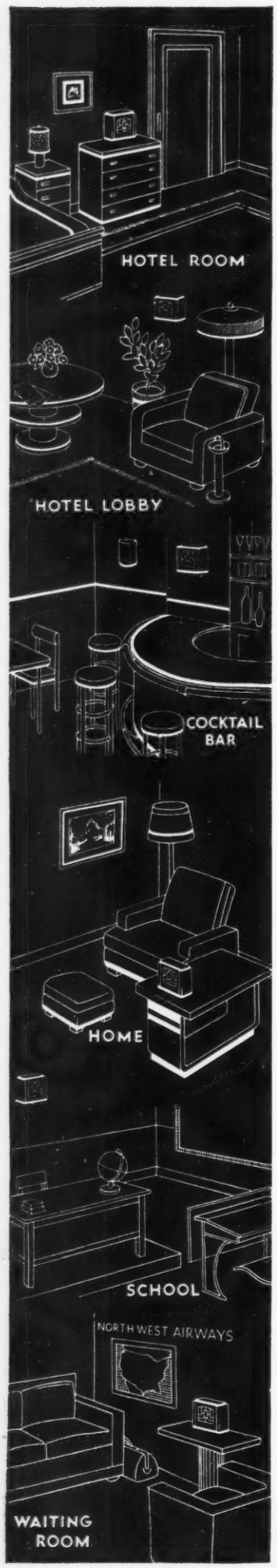
Here is the REAL problem and it is an important one! It is the bugaboo of the radio set manufacturer, who naturally finds it extremely difficult, to say the least, to reconcile the size and weight requirements of an adequate baffle, with practical merchandising.

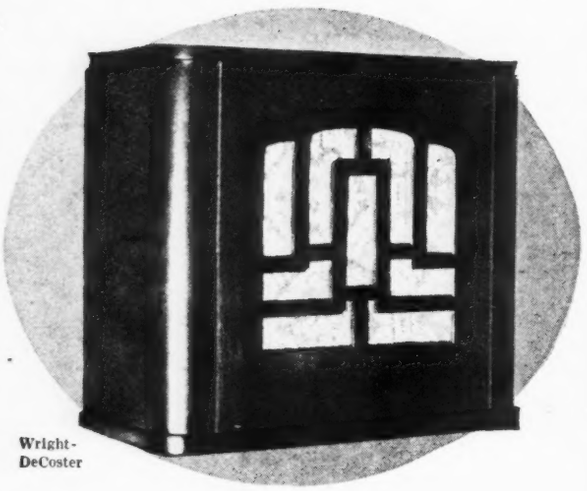
Let us look at the requirements: The serviceman knows that "high fidelity" reproduction (a much-abused term having, however, a very precise definition) requires that tones as low as 50 cycles per second should be reproduced with a maximum attenuation no greater than 10 decibels and that, theoretically, this means a baffleboard approximately 9½ feet square! "Pity the poor manufacturers and, incidentally," says the serviceman, "what in so-and-so can *I* do about it and how shall *I* start?

Well, it is surprising what an ingenious radio serviceman *can do about it* when he puts his mind to work. But it is distinctly a *specialty* job and one that should belong to the serviceman. It is his *own particular meat* and it is up to him to make the radio public realize it.

After a customer has been sold on the advantage of a *custom-built set* with a *good speaker installation* it is necessary to get together with him, look over the situation, and decide on the best way to do the job. In most cases 9½ square feet of (*Turn to page* 113)







Wright-DeCoster

Profits In

EXTENSION SPEAKERS

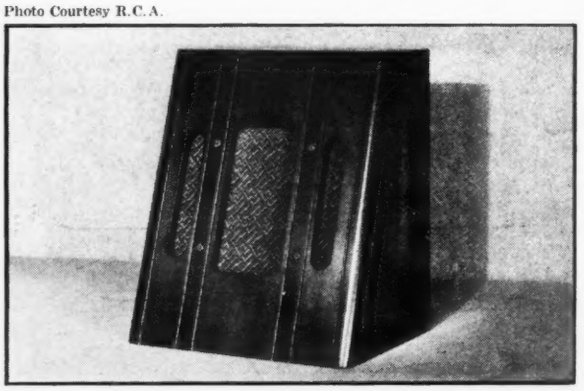
James Penfield

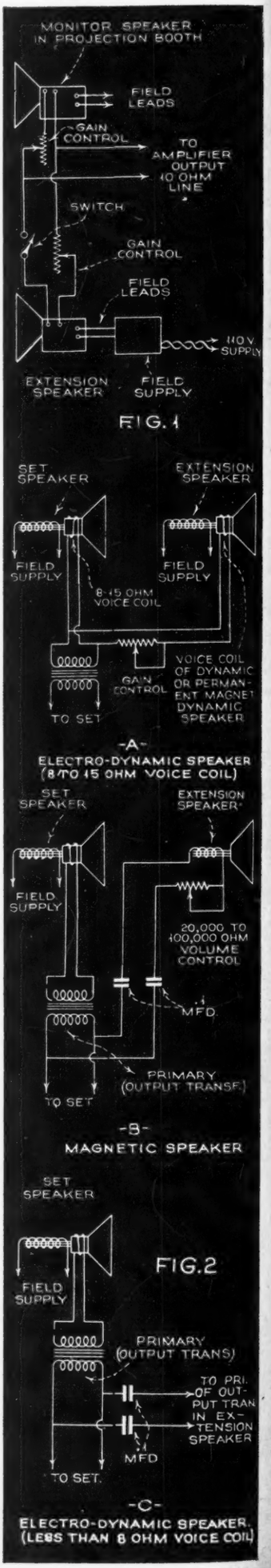
DURING the summer, when the serviceman's cash register rings all too seldom, ways and means of bringing in additional revenue become of greater importance. On this page are outlined five proven revenue-producing ideas.

¶ MANY GOOD CUSTOMERS will spend weeks or months touring and camping out. The auto-radio which they bought last year will relieve boredom while in the car, but what about the days in camp? An extension speaker takes up but little of the precious space available in the luggage compartments and may be arranged to plug in a jack which the serviceman can install on the instrument board of the car and wire in to the terminals of the standard auto-radio speaker, thus providing service in tents or cabins when the vacation budget does not permit the outlay for a complete additional set. When there is no local supply of electricity, as is so often the case in vacation-land, this feature provides the simplest and most economical method of enjoying radio. Likewise, an easy installation job for the serviceman and a profitable speaker sale.

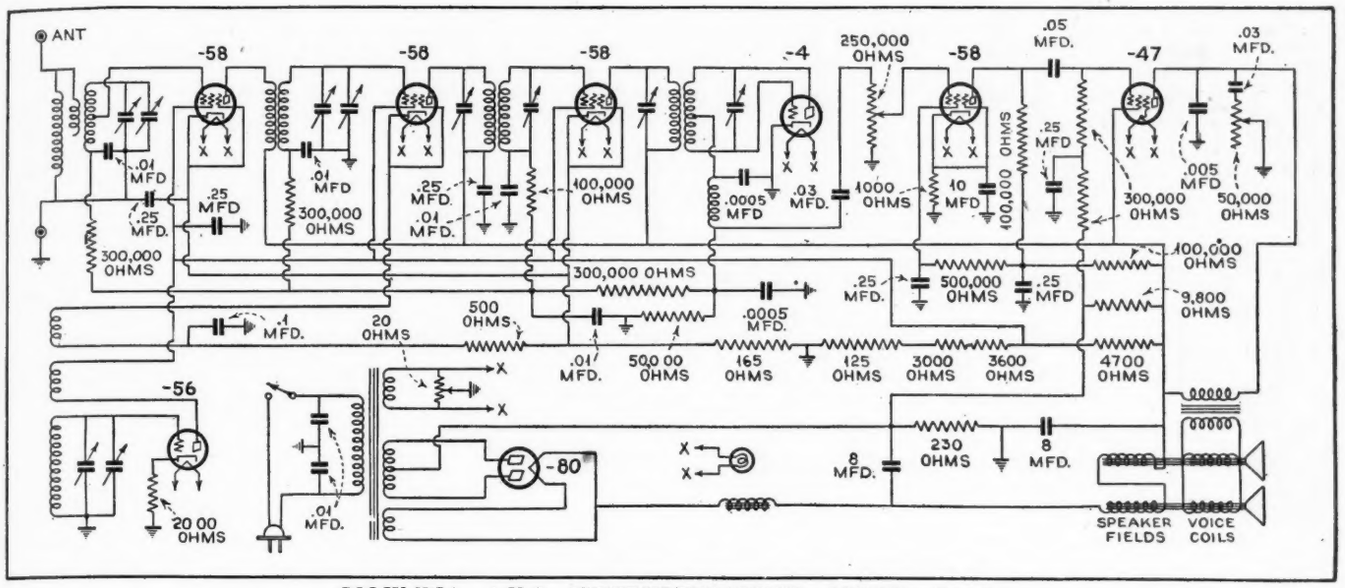
¶ NEIGHBORHOOD MOVIE THEATERS are excellent prospects for extension speakers. One or more dynamic speakers installed over the ticket office have proved of value in attracting patrons during slack periods. During a performance, the sound recording may be conducted from the theater speaker circuit to the extension speakers, invariably (*Turn to page* 113)

Photo Courtesy R.C.A.

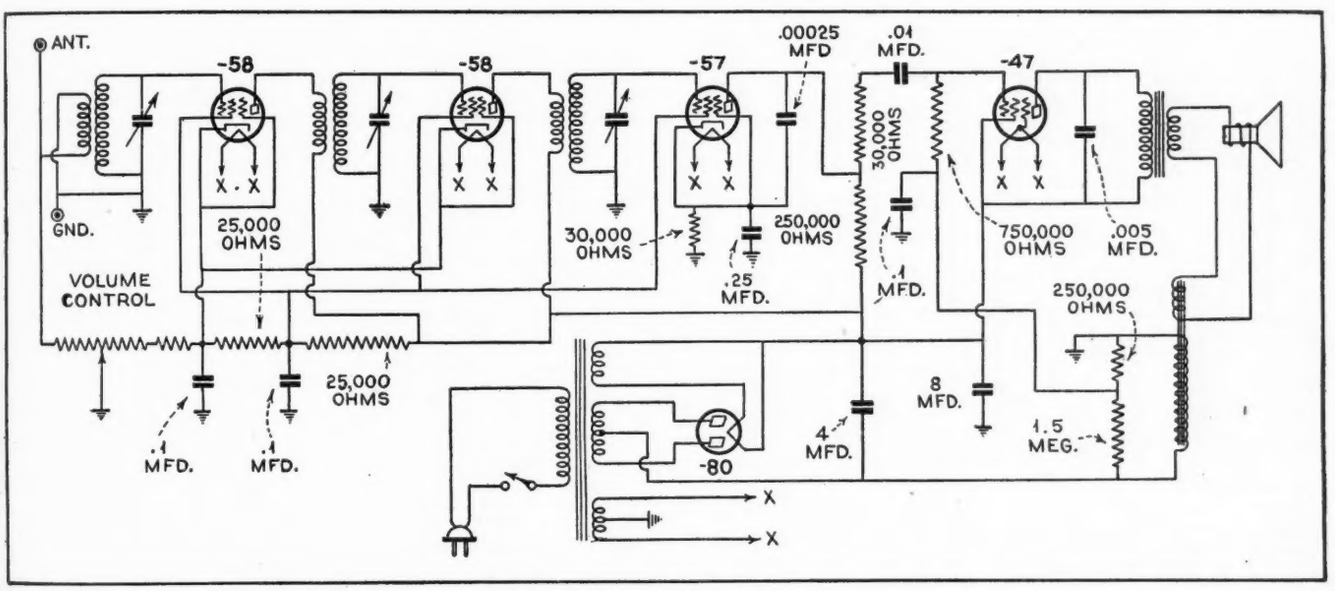




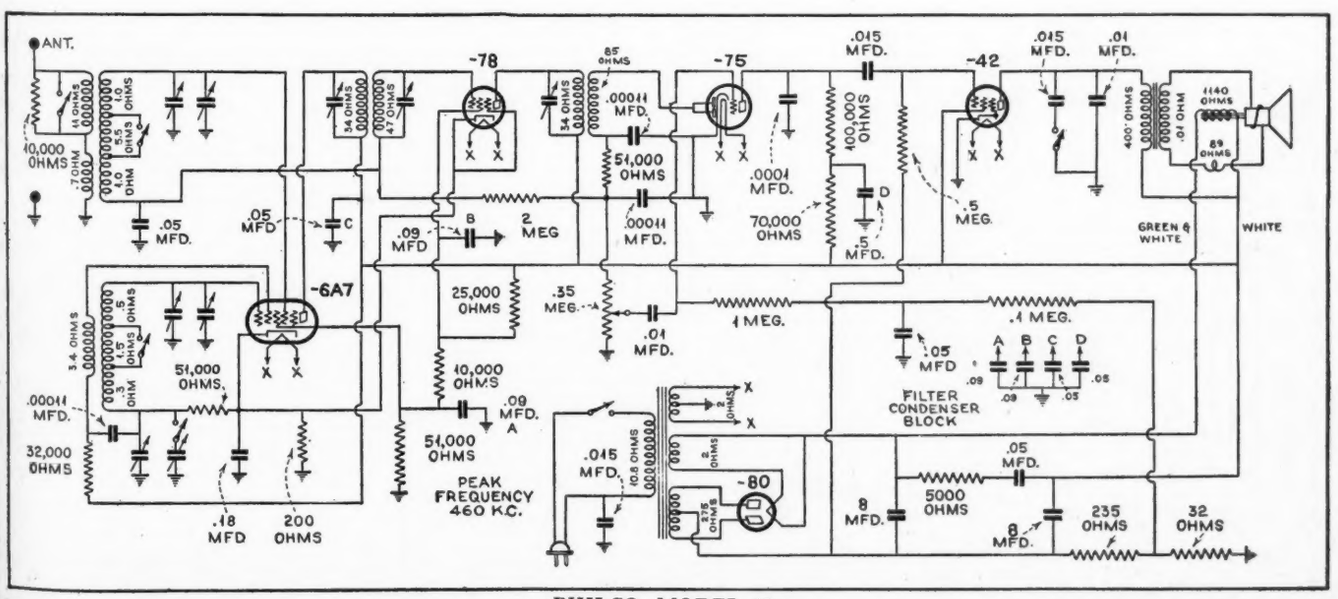
Hard-to-get Servicemen's Data



COLUMBIA, A.V.C. SUPERHETERODYNE, MODEL C-80-B



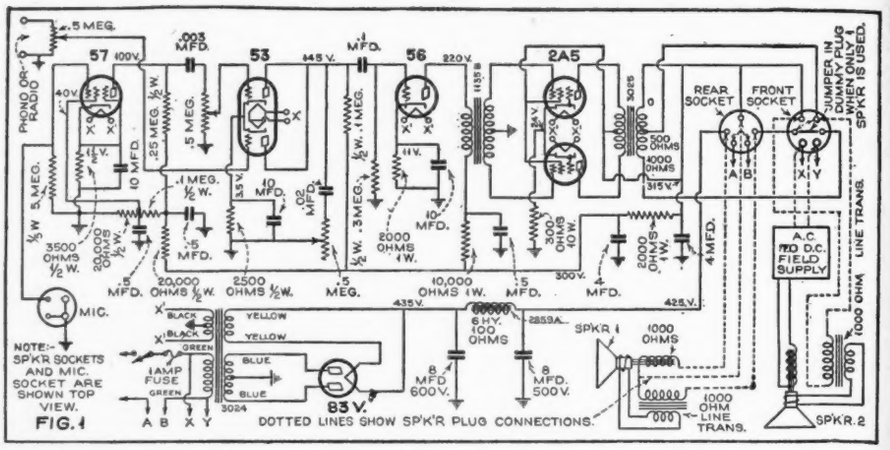
EMERSON, MODEL L-AC-5



PHILCO, MODEL 60

Compiled from J. F. Rider's Perpetual Trouble Shooter's Manual.

Don't Wait!



Here's YOUR Start in P.A.

By **Richard Feeney**

THE six-tube all-purpose public-address system described here is a direct invitation to servicemen and dealers to make extra dollars by adapting it either, as a profitable side-line for rental, or for permanent installation in numerous sound-distributing applications calling for a compact medium-size P. A. system.

Featuring high-quality and high-gain (approximately 120 db. at 1000 cycles) this new 8-watt amplifier designed and engineered by the Radolek Company, is equipped with mixing and fading facilities, a tone control that can be used to reduce acoustical feedback and to compensate for poor room acoustics and universal input and output provisions, not usually provided in a small amplifier of this type. The input circuit of the amplifier is arranged for either carbon, crystal or velocity type microphones and there are provisions for radio and phonograph connections. The use of a carbon microphone simply requires a matching transformer and a small battery connected in the conventional manner to supply the exciting voltage for the microphone. The transformers, filter units and the tubes are fully shielded. The level of hum is extremely low. The overall dimensions are 6½ inches by 8¾ inches by 15 inches and the weight is 12½ pounds.

The amplifier is designed to deliver 8 watts of undistorted power output to the speaker voice coils, sufficient power to operate two large auditorium type dynamic speakers, or 7 small size dynamics or 20 magnetic type reproducers.

A Resistance-Transformer Coupled Circuit

In a brief summary of the design and operation of the unit we first point out that it works directly from 105-125 volts, 50-60 cycles, a.c. line. There are four stages in all, employing five tubes. The first stage incorporates a type 57 which is resistance-coupled to a type 53 connected as a triode. This tube is in turn resistance-coupled to a 56 tube which is transformer-coupled to a pair of 2A5's in push-pull. The new 83V tube is used for rectification. The power consumption is about 75 watts.

The controls and connections on the front of the chassis reading from left to right, are, first, the dual tip jack for phono-radio connections, the microphone socket, microphone volume control, phonograph-radio control, combined "on-off" switch and tone control, a socket for the additional speaker and a jewel-type "ruby" pilot is on. The 5-prong speaker socket is light which indicates when the a.c. power mounted on the rear of the chassis.

AUTO RADIO

Jingles the

CASH REGISTER

F. E. Kunkel

AUTOMOBILE radio sets offer an excellent sales prospect for the serviceman and dealer, particularly during the summer months. To cash in on automobile radio sales, however, it is necessary to go out and get the business. It will not come in any great volume of itself.

Harry C. Grove, a radio dealer in Washington, D. C., has found that the note of trade survival, for him at least, lies in pushing automobile radio sales. His success in this line qualifies him to offer some suggestions for the benefit of others.

"Demonstration is the thing that sells them," he says, "demonstration right in the automobile. This is the most important thing. We have an outside salesman especially to contact automobile owners. He has a radio in his car and demonstrates while he talks. Nothing so fascinates and satisfies the prospect as to demonstrate to him what an automobile radio will actually do when installed in his own car.

"Take, for example, a night demonstration. You take a man, or a husband and wife, for a ride into the country. Stop in some stretch of woodland and listen to the night sounds. Then turn on the radio and show them the wonderful results. That kind of a demonstration is the very best type of sales talk.

"Of course, there is always the question of getting leads. We have four ways of doing this. First, we use small-space newspaper advertising. Second is the direct mail approach to all new car buyers. Third, we send out postcards to selected lists of automobile owners. Fourth, we drop cards in automobiles parked on the streets. Such a card is illustrated herewith.

"These methods result in many prospects coming in or calling up, and from this 'drop in' business we make a lot of sales.

"Another thing that we find helpful is to have our salesman's car equipped with a receiver. He stops and parks at strategic points with the instrument going full blast. It is usually found that several passersby will stop, listen, and ask questions. Many of these develop a definite interest, in which case, our man arranges for a private demonstration.

"Naturally enough a satisfied customer is one of our best advertisers. By making every installation thoroughly good, friends of the owner are impressed and the owner himself is so satisfied that he recommends us to his friends."

This business of the Grove Company is, of course, largely a "drop-in" business, but the point is that this concern does not allow this process to be entirely a voluntary one. Instead they devote every effort to inducing prospects to call and further, they go out into the highways and byways digging up and developing prospects.

$URE *fire* Dollars *for* $ERVICEMEN *Station Operators*

By Hubert L. Shortt

THE radio serviceman and the broadcast station engineer who want additional income will do well to consider the possibilities of getting together into a sort of "sound-amplifier" partnership as a profitable side line for both of them. Many engineers in various parts of the country are already *in* it and are *making money out of it!* Also many servicemen are *in* it and *likewise making money out of it!* Why not join forces and *increase* profits?

The Engineer's Part

The tie-up is a "natural." The fact that a man works for a broadcast station gives him prestige in the community, and since microphones and loudspeakers are associated with broadcasting anyway, the engineer remains in character. The wide-awake serviceman is just the person to take care of the operating end of the business.

In many medium-sized cities the station owners permit brief "commercial" announcements over the air to the effect that their engineers are prepared to install and operate public-address equipment for outdoor events, dances, lodge meetings, picnics, etc. This advertising produces fine results, as potential users of this type of service naturally have a lot of confidence in the engineers employed by a broadcast station, which is a sort of public utility.

In some cases the station owners get a small "cut" from the business in return for the time on the air; in other cases the station owners are glad to give the time free, as it enables their men to supplement lean salaries and they remain with the station as contented and efficient employees.

In the handling of an "outside" business of this kind, it is advantageous for station engineers to co-operate closely with local servicemen, for several reasons. First, in a city of any size there invariably is a serviceman or service organization already in possession of good P.A. apparatus. Servicemen are glad to do the actual work, under the auspices of the station engineers, and thus relieve the latter of all responsibilities in connection with the apparatus.

The Servicemen's Part

Under other conditions, the station men may not have enough money themselves to buy a P.A. outfit; they can pool their resources with those of an independent serviceman and thus swing the purchase of a good amplifier for their common use.

Another thing: Many small or medium-sized broadcast stations have no shop or repair facilities. They really don't need them, as the average station runs along for years without requiring much attention. The serviceman, on the other hand, must have a fairly respectable shop for his own business, and therefore he is the one who should take care of the P. A. equipment. Any portable unit requires inspection, adjustment and occasional repair, as it suffers many more hard knocks than a mere fixed installation.

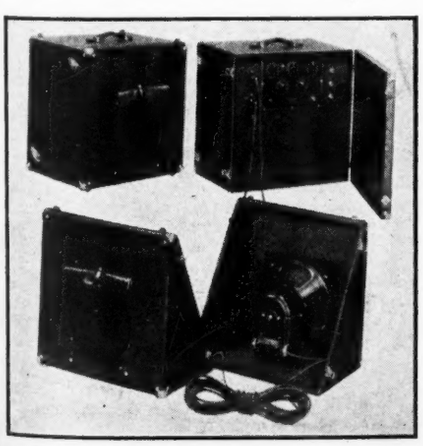
What the situation boils down to is this: the station engineers act as salesmen, taking advantage of the advertising opportunities at their disposal. The affiliated servicemen build and take care of the equipment, its setting up, wiring, control, etc.

Typical of the amplifiers that have proved popular among broadcast engineers and servicemen for free-lance work is the Lafayette Model 140-A 20-watt portable. In designing this amplifier it was decided that since all "portables" are heavy at best, there was no sense in skimping on important parts and a portable that is the equal of a fixed outfit was the goal set.

The outfit consists of two identical carrying cases, one containing the amplifier proper and its associated control equipment and the other two 12-inch dynamic speakers. The speakers draw their field current from the amplifier and are connected to it through 500-ohm lines and suitable matching transformers. The connecting cables are 50 feet long.

A Partnership System

The amplifier itself uses push-pull parallel 2A3's, with full output of 20 watts into a 500-ohm line. The tube line-up starts with a 57, connected as a triode, which works (*Turn to page* 124)



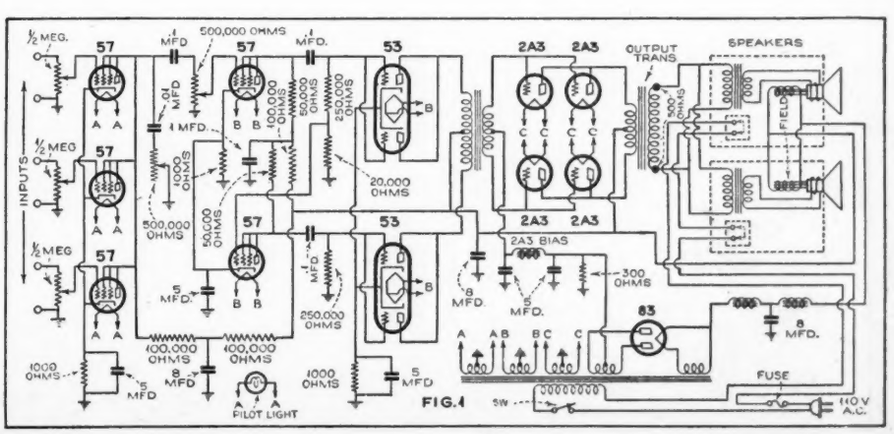


FIG. 1

1. Ultra-Sensitivity—at Radio and Audio Frequencies
2. Single Adjustment
3. Accuracy
4. Self-Calibrating
5. No Graphs or Charts Needed
6. A.C. Operated

6 Reasons Technicians *This New* V. T.

By John H. Potts

Part One

WHAT may well be the most important development to date in the line of radio service and laboratory instruments is the latest invention of John H. Potts — a vacuum-tube voltmeter capable of r.f or a.f. measurements *in terms of microvolts.* A model of this instrument, especially constructed for RADIO NEWS, is described in this and the articles to follow, with full constructional details.—*The Editors.*

DURING the past few years, a steadily increasing number of laboratory trained engineers have entered the service field. In addition, professional radio servicemen are devoting more and more time to study of the technical side of their work. These conditions have created higher standards of workmanship and a desire for greater efficiency in handling work on a quantity production basis. There is an insistent demand for more specialized test equipment which will enable the more rapid handling of sets brought in to the shop, especially when the trouble is transient in nature. A quick measurement of receiver sensitivity is likewise of value in determining the degree of improvement after aligning or other work has been done.

The instrument to be described is a vacuum-tube voltmeter of unusual sensitivity, adaptable to an extraordinary range of tests. Voltage or current measurements may be made either d.c., or of a.c. from below 20 cycles to an undeterminable range above 25 megacycles. The sensitivity is great enough to enable tests of insulation leakage, such as occurs in condensers, etc. In conjunction with an oscillator, measurements of inductance, capacity, impedance and power factor may be made at any frequency within its unusual range. In conjunction with a small search coil or condenser, it is possible to make a stage by stage test of receivers at radio frequencies—invaluable for sets with intermittent troubles when the use of voltmeters of the ordinary type is impractical. An attenuator (included in this meter unit, and to be described later) makes possible the calibration of the ordinary service oscillator, giving quantitative measurements of receiver sensitivity in micro-volts. It is because of this that it is deemed entirely logical to call this instrument a "*Micro*-voltmeter.

Essentially, the instrument consists of a diode rectifier followed by a direct-coupled amplifier. The extraordinary frequency range is due to the simplicity of the input circuit and also to the fact that all amplification follows, rather than precedes, the rectifier.

Though the apparatus uses a d.c. meter of 1 ma. sensitivity, full scale deflection is obtained for from 30 to 70 millivolts input, alternating current, depending on the characteristics of the tubes, the applied voltages, and other factors to be discussed later. The instrument requires no graphs or charts; means are included in the instrument to calibrate it instantly at any point in its range, by simply throwing a switch and turning a knob.

Device Is Completely Line Operated

The fundamental circuit of the device is shown in Figure 1. In spite of its high sensitivity, the instrument is completely a.c. line-operated, a conventional power supply being used. For simplicity, the power supply is omitted in these preliminary drawings. The circuit shown indicates a balanced bridge arrangement of two 6B7 and two 6C6 tubes. Only the two tubes in the upper half of the diagram are acted upon by the voltage under test, which is applied to the terminals A-B, the remaining tubes serving to stabilize the current distribution. With no voltage applied to the input, a minute electron-flow

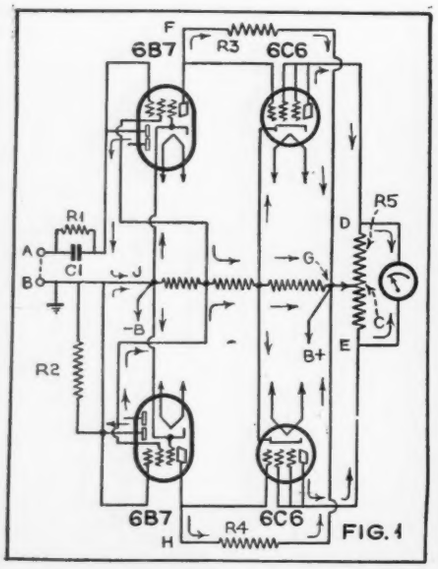
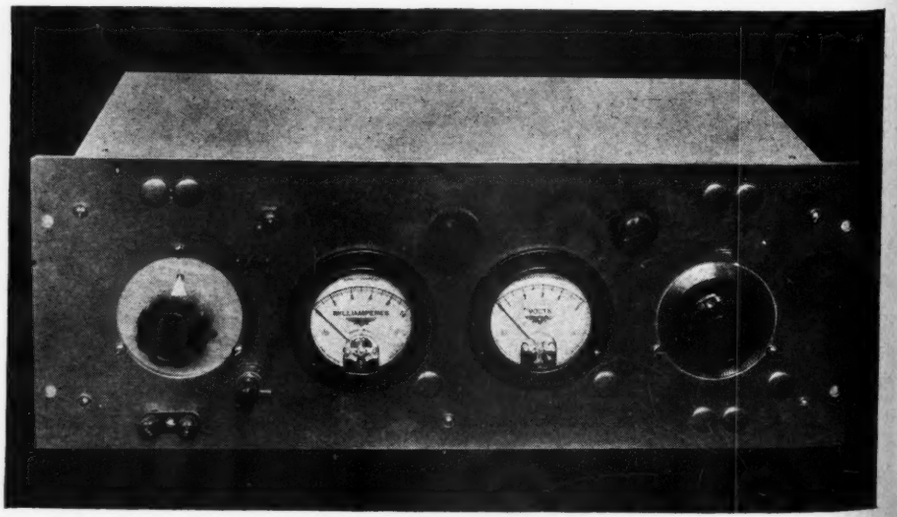
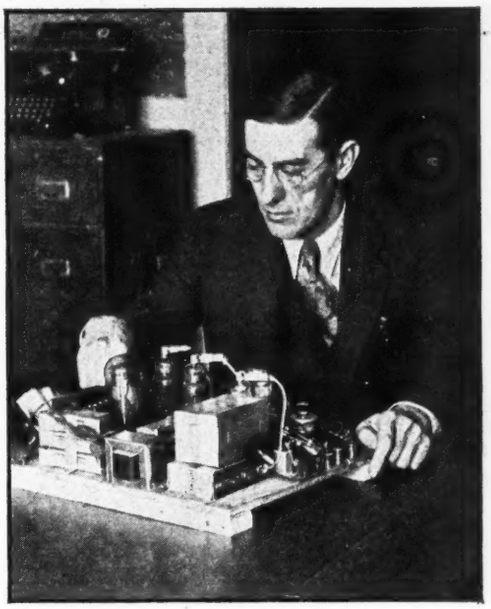


FIG. 1



Why— *Will Welcome* VOLTMETER



JOINS RADIO NEWS STAFF

RADIO NEWS *takes pleasure in announcing that John H. Potts, inventor of the instrument described in this article, has joined its staff. As Associate Technical Editor he will devote special attention to the problems of the serviceman—a field in which he is well qualified as a result of his experience as a former test equipment design engineer for R. C. A., and several years as a practical serviceman.*

from each cathode of each 6B7 to one diode plate of each tube returns through R1 and R2. The resulting voltage drop forms the negative bias for the control grid of the pentode section of each of these tubes. The remaining elements are connected in a manner similar to that of a push-pull amplifier, the direction of electron-flow being indicated by arrows. The 6C6 tubes are connected as triodes, increasing the mutual conductance.

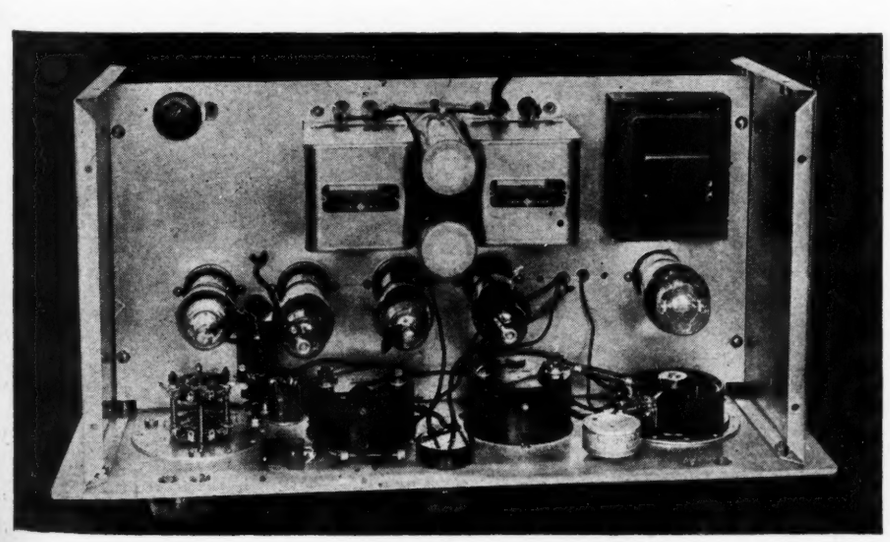
Line Variations Are Compensated

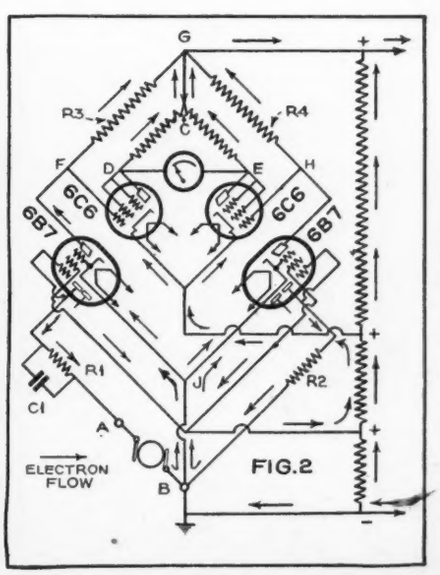
Considering the circuit, if each pair of similar tubes has identical characteristics, with no signal input precisely the same current will flow in the upper and lower halves of the circuit of a valve, depending upon the voltage across the divider. That is, if the voltage across the divider should increase, due to line voltage fluctuation, the voltage applied to each tube element will likewise increase. If these increments are identical, the voltage drop across C-D will equal that across C-E. Therefore, the potential difference across the points D-E, to which the meter is connected, is zero and the meter therefore shows no reading. Any increase or decrease of current with no impressed signal, due to variation in the line supply should affect all circuits to the same degree and therefore the meter should continue to maintain its zero setting.

The same circuit, drawn in the form of a complete bridge, is shown in Figure 2. Applying the same analysis to the outer bridge, F-G-H-J, it will be seen that when this bridge is balanced there is no potential difference between points F and H. In order to effect an independent balance of this outer bridge, in the final circuit, the screen voltage was made adjustable for one of the 6B7 tubes so that its plate current may be made identical with that of the other. This is, however, not always desirable.

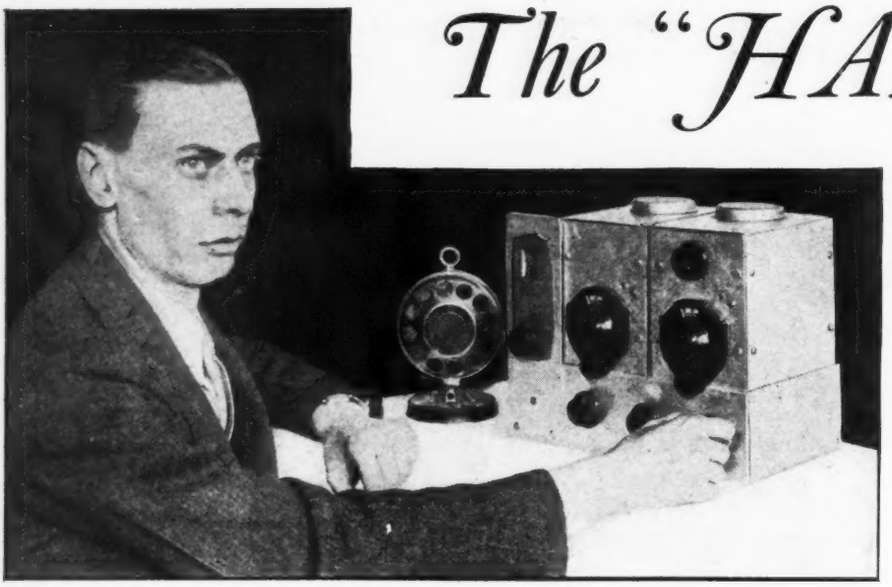
The preceding discussion has covered the theory of the stabilizing action on the assumption that each pair of similar tubes have substantially the same characteristics. Under these conditions, maximum stability is obtained when the adjusting potentiometer, R5, is set so that resistence between the points C-D and C-E is the same. Under circumstances where too much variation in the characteristics of the tubes is present and the line voltage has frequent and sudden surges, a stable zero setting may be obtained by moving the potentiometer arm close to the point E and varying the screen voltage of one of the 6B7 tubes until the meter again reads zero. Using this method, it was found possible to maintain a stable zero setting with tubes chosen at random when the voltage supply source was a motor generator with very bad voltage regulation.

It is quite important, in any direct-coupled amplifying system, that voltage relationships be thoroughly understood. In this circuit, as shown in Figure 1, let us assume the cathodes of the 6C6 tubes to be connected at a point on the voltage divider at 130 volts positive with respect to ground. The control grids of these tubes are connected to the plates of the 6B7 tubes, which, after subtracting the voltage drop due to the plate current through the load resistors R3 and R4, have a potential of 118 volts with respect to ground. Thus, there is a 12 volt potential difference between the cathodes (*Turn to page* 118)





The "HAM" Shack



¶ A Department for the amateur operator to help him keep up-to-date

Conducted by
Everett M. Walker
Editor for Amateur Activities

THE value of adequate measuring equipment in contributing to the operating efficiency of the amateur station cannot be underestimated. Most amateurs are content to "get by" with a minimum of instruments. They regard a milliammeter the most essential and rely almost entirely on the manufacturers' specifications for output voltages of power equipment, frequently neglecting to take into account odd pieces of apparatus that are pressed into service which the manufacturer never intended to be used with his power equipment. The result is a wide deviation from the rated output of the power supply available, with the consequent inaccuracy in calibrating wattage inputs, impedances, etc.

MILLIAMMETERS are valuable instruments in tuning an amateur transmitter, and it is almost impossible to do a satisfactory job without at least one that may be plugged into the grid and plate circuits of each of the tubes used in the transmitter. But efficiency cannot be determined without knowing the voltage applied to the plate and grid circuits and the value of the resistors used in the transmitter.

Perhaps one of the most valuable instruments, second only to the milliammeter, is a reliable voltmeter-ohmmeter. No amateur station is complete without one. It is impossible to measure grid bias voltages, which should be known to obtain the greatest tube efficiency; to compute output impedances for matching a modulator with a modulated amplifier, etc. The voltmeter range should cover the maximum voltages used in the transmitter with a high resistance per volt so the current consumed by the meter does not affect the output of the power supply. The ranges should cover from 50 to 2500 volts. An ohmmeter, of course, may be incorporated in a high-resistance voltmeter.

Any amateur who has ever used an ohmmeter can appreciate its value in the running down of trouble in either a transmitter or receiver. Resistors, due to no fault of the manufacturers, are extremely delicate devices and frequently become damaged in the course of handling before they find their way into the amateur transmitter, amplifier or receiver. Also, the resistance markings may become unreadable. Therefore, it is desirable to check all resistors before they are installed in any piece of apparatus about the ham shack.

Such an instrument is not costly. Jack Grand, of the Sun Radio Company, New York, has constructed an instrument that meets all of these requirements. The cost of the parts is less than $10, including such things as hardware, panel as well as resistors, and meter the most expensive item. The illustrations, wiring diagram and list of parts are self-explanatory. The most complicated part is the voltage-changing switch. Actually it is nothing more than a single sliding contact and a series of terminals whereto it may be adjusted to obtain different readings. The meter is mounted at the most logical point: at the top, in the center, where it may be read with ease. To the left below the meter is the rotary switch. To the right is a 1000-ohm rheostat for making zero adjustments for ohm readings. Between the two knobs is a double-pole, double-throw toggle switch which connects in an external battery of 27 volts for reading high-resistance values. A 3-volt battery is permanently installed in the instrument for reading low-ohm (LO) values.

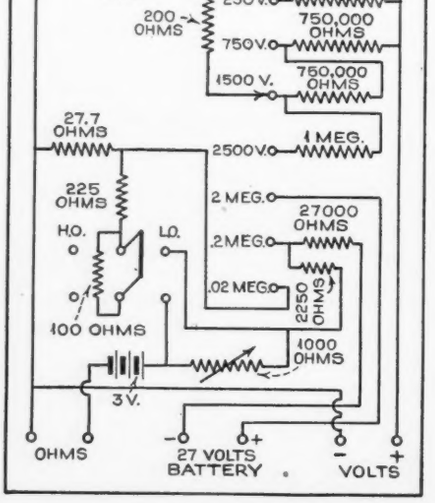
Readings that may be obtained with the "ham tester" are as follows: voltages, 0 to 50, 250, 750, 1500 and 2500 volts; resistances, 0 to 20,000 ohms (.02 megohms), 200,000 ohms, (.2 megohms) both with low-ohm (LO) setting, and 2,000,000 ohms (2 megohms) at high-ohm (HO) setting.

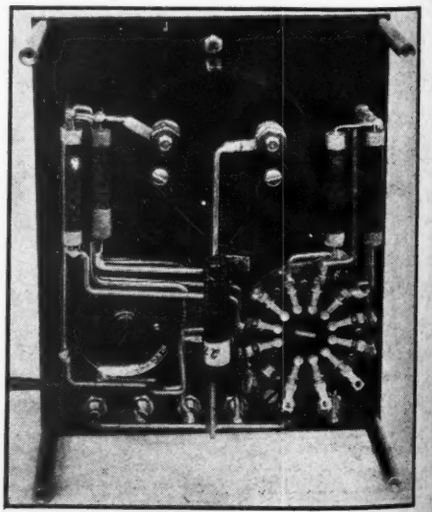
To take voltage readings it is necessary only to set the rotary switch at the desired voltage range and plug in a set of test wires (red for positive) in the jacks marked "Volts" in the diagram. If the voltage is unknown, it is desirable to begin at the highest range and reduce the range until the one that gives more than half-scale reading is reached. This facilitates more accurate measurement and at the same time serves as insurance against

(*Turn to page* 122)

HE'S ON THE AIR, BOYS!

With the call letters W2MW, friend Walker, your "Ham" Shack editor, may be heard on the short-wave bands almost every evening. Give him a "shout" on 75 meters around 9 p.m., E.S.T. and he'll be glad to talk to you, answer your questions, and receive your comments about this department.





RADIO NEWS Sponsors New Opportunity for Code Practice at Home

RADIO NEWS takes pleasure in publishing the following schedule of code transmissions in the United States especially for those who wish to learn the code over the air. All one has to do is to tune in to the proper frequency as specified at the proper time and day and start copying the special code transmissions for practice. A daily schedule is given for the present month (beginning June 4th and ending July 3rd). In the first column is the time (a.m. or p.m.); in the second column are the symbols E, C, M and P (where E is used for E.S.T., C for C.S.T., M for M.S.T. and P for P.S.T.). In the third column are the call-letters of the transmitters of amateur members of the Guild and the fourth column contains the frequencies of transmission in all cases, except where otherwise noted. Each CSCG transmitting station will begin his program at stated time by sending "CSG" 6 times, followed by his station call repeated 3 times, slowly. At intervals of 5 minutes, he will repeat "CSG" 6 times and his call letters 3 times. All who listen to CSCG programs are requested to write a card to the transmitting station telling him how his signals come in and, if possible, sending him copies of transmissions.

MONDAY

8:30	A.	E.	W1AMH	56,100–3,536½
9:00	A.	ED.	W2HZJ	3,577
9:00	A.	E.	W2AEJ	3,785
12:30	P.	E.	W2CXD	3,825
4:00	P.	E.	N1FNM	3,510
5:00	P.	P.	W7WE	3,637–7,274
6:00	P.	E.	N1DUZ	3,638
6:00	P.	E.	W8MHE	3,610
6:00	P.	E.	W8EEZ	3,598
6:15	P.	C.	W9LKK	3,757
7:00	P.	E.	W2HCP	3,753-3835.5
7:00	P.	C.	W9SFT	3,585

TUESDAY

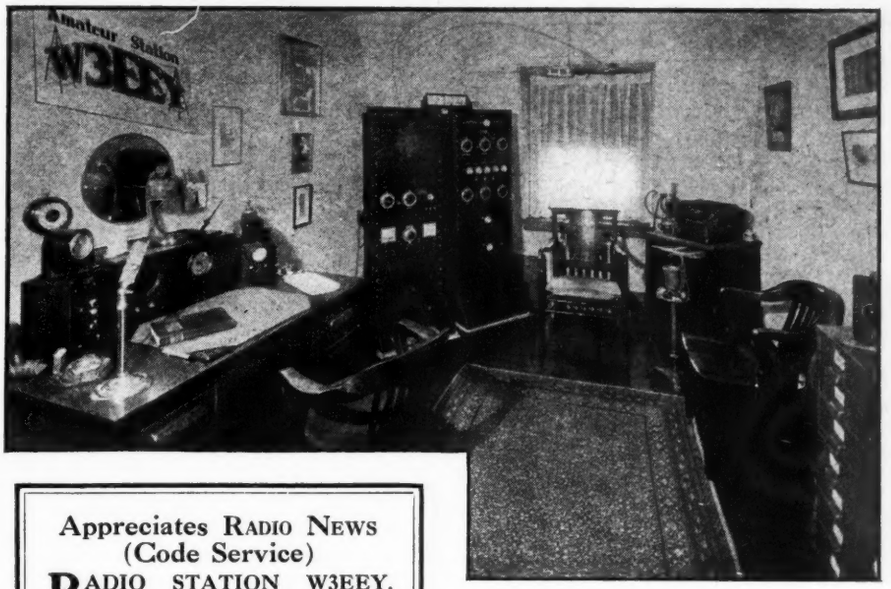
8:15	A.	E.	VE3UU	3,865
9:00	A.	ED.	W2HZJ	3,577
3:30	P.	C.	W9TE	7,012
4:00	P.	E.	N1FNM	3,510
6:00	P.	E.	W8MHE	3,610
6:00	P.	E.	W8EEZ	3,598
6:15	P.	C.	W9LKK	3,757
7:00	P.	M.	W9HHW	7,276
8:00	P.	M.	W7DBP	3,607
9:00	P.	E.	W8FQS	3,582
6:00	A.	C.	W5DDC	7,200

WEDNESDAY

9:00	A.	E.	W2HZJ	3,577
12:30	P.	E.	W2CXD	3,825
3:30	P.	C.	W9TE	7,012
4:00	P.	E.	N1FNM	3,510
5:00	P.	P.	W7WE	3,637–7,274
6:00	P.	E.	W8MHE	3,610
6:00	P.	E.	W8EEZ	3,598
6:15	P.	C.	W9LKK	3,757
7:00	P.	E.	W2HCP	3,753–3,835.5
7:00	P.	E.	W3AEJ	3,785
7:00	P.	C.	W9SFT	3,585
7:00	P.	M.	W9HHW	7,276
8:00	P.	M.	W7DBP	3,722

MEET O. M. BLOSER

He operates W2HCP in the Code Service Schedules and says, "FB having schedules published by RADIO NEWS."



Appreciates RADIO NEWS (Code Service)

RADIO STATION W3EEY, owned and operated by Dr. H. A. D. Baer, Surgeon in Charge, The Baer Hospital, Allentown, Pa. Dr. Baer says:

"All who have occasion to listen to the conglomerate transmissions on the amateur bands will appreciate what* RADIO NEWS *is doing by publishing CSCG Schedules.

"I extend my good wishes and congratulations to everyone behind this movement, to my fellow active CSCG members and to every listener. I shall be on the air regularly every Sunday at 10:30 a.m., EST, 3628 kc., and shall appreciate hearing from everyone who picks up my programs."

THURSDAY

8:15	A.	E.	VE3UU	3,865
9:00	A.	E.	W2HZJ	3,577
3:30	P.	C.	W9TE	7,012
6:00	P.	E.	W8MHE	3,610
6:00	P.	E.	W8EEZ	3,598
6:15	P.	C.	W9LKK	3,757
8:00	P.	M.	W7DBP	3,607
9:00	P.	E.	W8FQS	3,582

FRIDAY

9:00	A.	E.	W3AEJ	3,785
9:00	A.	ED.	W2HZJ	3,577
12:30	P.	E.	W2CXD	3,825
3:30	P.	C.	W9TE	7,012
5:00	P.	P.	W7WE	3,637–7,274
6:00	P.	E.	W9MHE	3,610
6:00	P.	E.	W8EEZ	3,598
6:00	P.	E.	N1DUZ	3,638
6:15	P.	C.	W9LKK	3,757
7:00	P.	E.	W2HCP	3,753–3,835.5
9:30	P.	E.	W4BHR	3,867

SATURDAY

8:15	A.	E.	VE3UU	3,865
8:30	A.	E.	W1AMH	56,100–3,536½
9:00	A.	ED.	W2HZJ	3,577
6:00	P.	E.	W8MHE	3,610
11:50	P.	P.	W7WE	3,637–7,274

SUNDAY

8:15	A.	E.	VE3UU	3,865
9:00	A.	ED.	W2HZJ	3,577
10:30	A.	E.	W3EEY	3,628
10:30	A.	C.	W5DDC	7,200
1:00	P.	P.	W7WE	3,637–7,274
6:00	P.	E.	W8MHE	3,610
8:00	P.	M.	W7DBP	3,722

Active Members Candler System Code Guild

W1AMH—Harold J. Mores, 48 Hebron St., Hartford, Conn.

N1DUZ—J. E. Vermeiren, 137 Middlesex St., Springfield, Mass.

N1FNM—G. W. Wabrek, New Hartford, Conn.

W2CXD—Roy Cattell, Kiel Ave., Butler, N. J.

W2HCP—A. P. Bloser, 82 Dove St., Albany, N. Y.

W2HZJ—Walter G. Germann, 905 E. 169th St., New York, N. Y.

W3EEY—Dr. H. A. D. Baer, BAER HOSPITAL, Allentown, Penna.

W3AEJ—Geo. W Knowles, 82 Elgin Ave., Westmont, N. J.

VE3UU—Gordon Murray, 53 Elm Grove Ave., Toronto, Ont., Canada.

W4BHR—James D. Randolph, Warren Plains, N. C.

W5DDC—Herbert Leo, 1420 Hawthorne St., Houston, Texas.

W7WE—Loren C. Maybee, 3516 Hudson St., Seattle, Wash.

W7DBP—F. W. Stuart, R. F. D. No. 2—Boise, Idaho.

W8FQS—Philip McMunn, 29 Ramble Ave., Chautauqua, N. Y.

W8MHE—Charles L. Gibson, 9 Sycamore St., Natrona, Pa.

W8EEZ—Tauno M. Alanen, 512 New St., Fairport Harbor, Ohio.

W9HHW—Denzel Begley, Box 46, Ft. Meade, S. Dak.

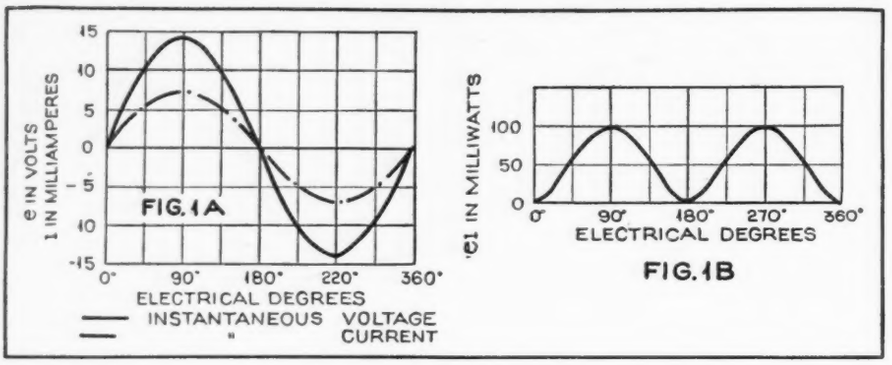
W9SFT—Gerald Broughton, CCC Co. 735, Scammon, Kansas.

W9TE—A. L. Braun, 5211 Brookville Rd., Indianapolis, Ind.

W9LKK—Sidney Schulz, 3132 4th St. S. E., Minneapolis, Minn.

"THE OLD BOY HIMSELF"

That's the way Charles L. Gibson, owner of W8MHE, one of the stations transmitting the Code Service Program this month, signed himself on the back of this photograph. He says, "It's fine to have RADIO NEWS *publish these schedules."*



THE AUTHOR

Theory and Practice for Correct

IMPEDANCE MATCH

C. A. Johnson

Part One

THE term "impedance" and the expression "impedance matching" are part of every radio engineer's vocabulary. It does not follow, however, that he has a clear understanding of their meaning. This unfortunate fact is partly the result of failure to understand the fundamentals of the subject. It is hoped that the following discussion will enable the reader to clear up, in his own mind, some of the mysteries which so often surround the problems dealing with the impedances of electrical apparatus and circuits.

IN general, the impedance of a circuit is determined by the combined effect of three circuit elements. They are (1) resistance, (2) inductance and (3) capacity. In order to understand their effects, in combination, we must first examine their behavior, individually. These pure elements can only be approximated in the design of physical apparatus. However, for the sake of simplicity, we will assume for the time being, that we are dealing with the pure elements. You will see later on that this assumption will not interfere with the practical application of the conclusions obtained.

Each of these elements has a tendency to oppose the flow of current when voltage is applied to its terminals. The nature of this opposition is different so we must examine each separately. A pure resistance opposes current flow, because it permanently changes a part of the electric energy into heat; which is dissipated and lost forever where the circuit is concerned. Ordinarily we define the unit of resistance, the ohm, by Ohm's Law as follows:

$$R = \frac{E}{I} \text{ ohms}$$

It could be defined equally well by Joule's Law:

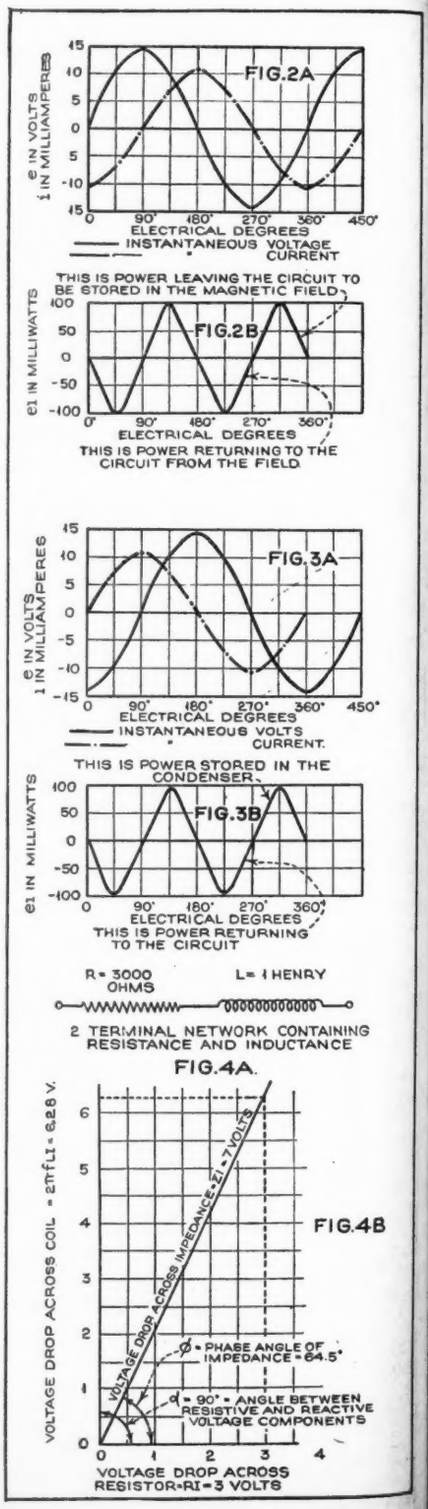
$$R = \frac{\text{watts dissipated}}{I^2}$$

Thus we see that the basic quality of a resistance is that it permanently removes some of the electric energy from the circuit. Since no frequency term enters into its definition, this property is the same for any frequency including zero (which is d.c.).

The general behavior of any circuit element (when an alternating voltage is applied to its terminals), can be clearly illustrated graphically. Figures 1(a) and 1(b) illustrate the voltage, current and power relations when an r.m.s. potential of 10 volts is applied across 2000 ohms. The instantaneous voltage and current are represented respectively by e and i. Figure 1(a) shows the relation between these two quantities for one complete cycle or 360 electrical degrees. Note that they are always in phase. Figure 1(b) is a curve of the power dissipated by this resistance, for one cycle. Since both current and voltage change sign simultaneously, the power remains positive for both the positive and negative part of the cycle. This means that power is always being removed from the circuit. The area under the curve is a measure of the total power dissipated for one cycle.

When a potential is applied to the terminals of a pure inductance, part of the electrical energy flowing into it is stored in the form of a magnetic field. If the current varies the field also varies, *but in a direction to oppose the change in current* (Lenz's Law). Thus the magnetic field surrounding an inductance coil is said to "react" on the circuit; and an inductance is said to possess "reactance." The effect of this reactance is usually measured in terms of equivalent ohmic resistance and is denoted by the symbol X_l. The formula for the inductance reactance of a coil is:

(*Turn to page* 128)



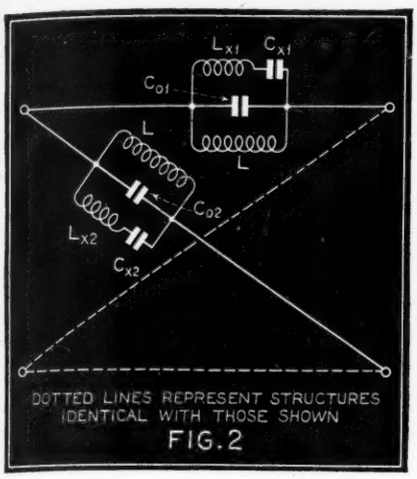


FIG. 2

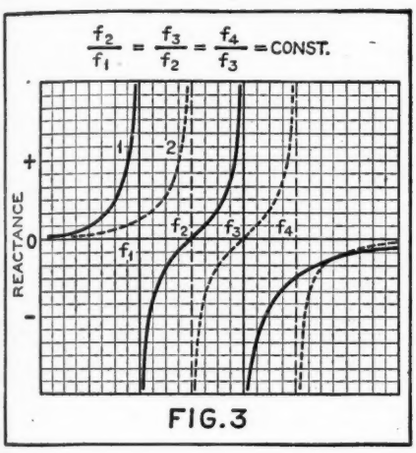


FIG. 3

$$Z = \frac{\omega_1 \omega_4 L}{\omega_4 - \omega_1} \quad (1)$$

WHERE, ω_1 AND ω_4 ARE $2\pi f_1$ AND $2\pi f_4$

$$\frac{1}{C_{o1}} = L \frac{\omega_1^2 \omega_3^2}{\omega_2^2} \quad (2)$$

$$\frac{1}{C_{x1}} = L \frac{\omega_1^2 \omega_2^2 \omega_3^2}{(\omega_2^2 - \omega_1^2)(\omega_3^2 - \omega_2^2)} \quad (3)$$

$$L_{x1} = L \frac{\omega_1^2 \omega_3^2}{(\omega_2^2 - \omega_1^2)(\omega_3^2 - \omega_2^2)} \quad (4)$$

$$\frac{1}{C_{o2}} = L \frac{\omega_2^2 \omega_4^2}{\omega_3^2} \quad (5)$$

$$\frac{1}{C_{x2}} = L \frac{\omega_2^2 \omega_3^2 \omega_4^2}{(\omega_3^2 - \omega_2^2)(\omega_4^2 - \omega_3^2)} \quad (6)$$

$$L_{x2} = L \frac{\omega_2^2 \omega_4^2}{(\omega_3^2 - \omega_2^2)(\omega_4^2 - \omega_3^2)} \quad (7)$$

FIG. 4

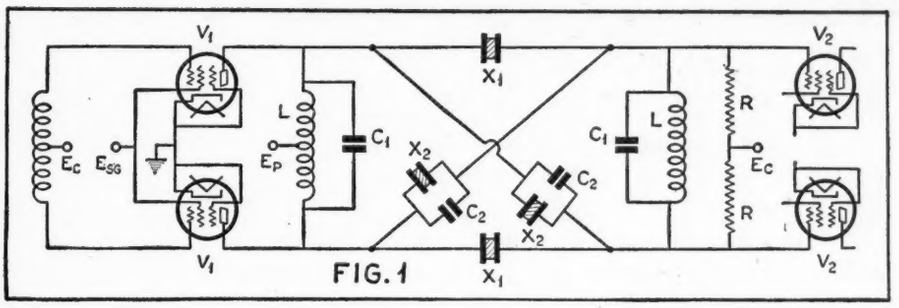


FIG. 1

The Design of Broad-Band

CRYSTAL FILTERS

W. W. Waltz

Part Three

IN the preceding articles in this series we discussed briefly the characteristics of quartz crystals and showed the equivalence between plates cut from these crystals in an electrical circuit, and a simple combination of inductance and capacity. Necessarily brief, the discussion hinted at several factors not generally known about the behavior of quartz plates as controlling elements. To those interested the material referred to in the footnotes at the end of this article should prove to be a prime source for the most illuminating data yet made available on this subject. (See footnotes 1, 2 and 6.)

HAVING discussed the low-pass filter, we now turn to that type which will be of the greatest interest to the radio profession, namely, the band-pass section. There are so many possibilities, that is, arrangements of the elements within the band-pass sections, that we can but touch briefly upon them here. Much more extensive information is available in the numerous references cited in the footnotes.

As was pointed out in the last article, a T section made up of crystals and condensers is a band-pass filter, but it has so many limitations that its use as the i.f. filter of a superheterodyne for broadcast reception would provide results even worse than those occasioned by the side-band trimming of present-day receivers. However, it was also pointed out that the lattice-type of structure removes the limiting factors, and gives a filter characteristics which so closely approach the ideal "square" response curve. But the lattice network is not a cure-all for the headaches of circuit designers. It has its drawbacks, chief of which is that, for intermediate-frequency filters for the conventional 175-kc. amplifier, extremely thin plates are necessary. This, however, is not serious when one considers the small amount of power which the crystal would be called upon to handle and with the trend towards higher intermediates it seems that this point becomes of academic interest only.

A brief inspection of the lattice-type structure will show that it is of the so-called "balanced" type of circuit, that is, half of the series, or line, impedance is on each side of the circuit. This is satisfactory where the differential, or push-pull, arrangement of tubes is used, but it presents difficulties for the ordinary cascade arrangement used in receivers. In order to illustrate the application of the design methods we will consider first a lattice-type section working between push-pull tubes in an i.f. amplifier. Figure 1 shows such a filter. In this circuit V_1 represents i.f. amplifiers, and V_2 either additional amplifiers or push-pull detectors. X_1 and X_2 are the quartz plates; the coils L, in addition to forming part of the filter, serve as a path for the plate currents to V_1. The condensers C_1 and C_2 complete the resonant elements of the filter. The resistances R, are equal to the plate resistances of V_1 and serve to terminate the filter properly.

This filter can be reduced to the electrical structure of Figure 2, in which L_{x1}, C_{x1}, and C_{o1} represent the electrical equivalents of the crystals X_1; L_{x2}, C_{x2}, and C_{o2} are the equivalents of the crystals X_2. The capacities C_{o1} include the capacities C_1 which, in the filter of Figure 1, shunt the coils L; and C_{o2} includes the capacities C_2 which shunt X_2.

The curves of Figure 3 show the reactances of the branches of the equivalent circuit; curve 1 being for the line branches and curve 2 for the lattice branches. The coincidence of the points of resonance and anti-resonance of the various curves shows that this is a band-pass filter. This checks with the general theory of wave filters, and, more especially, with the theory of the confluent band-pass structure. The points f_2 and f_3 are points of resonance for the crystals X_1 and X_2 respectively.

In order to determine the value of the elements of the equivalent circuit it is necessary to know the characteristic impedance of the filter and the inductance of the coils L. The impedance Z is determined by the impedance of the circuit out of which the filter is to work; for reasons which can not be gone into here (footnote 7) Z should actually be about 20% less than the (*Turn to page* 115)

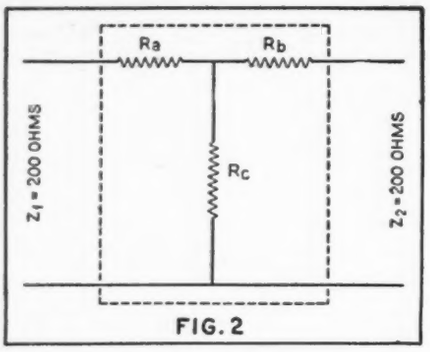


FIG. 2

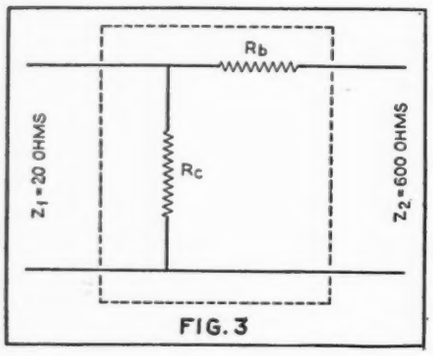


FIG. 3

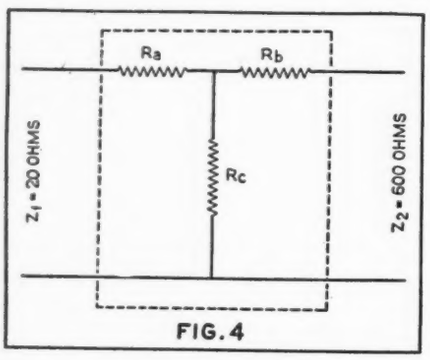
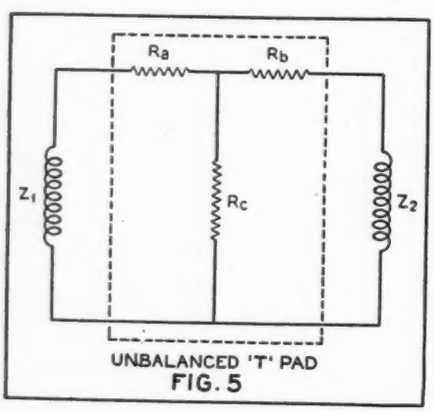
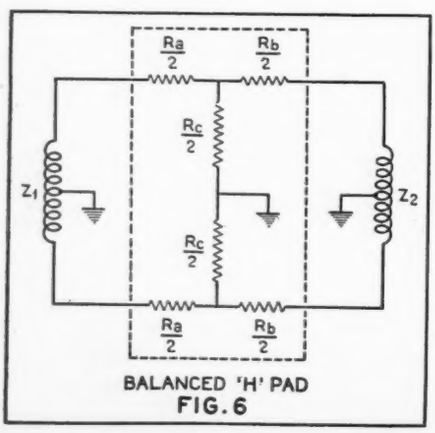


FIG. 4



UNBALANCED 'T' PAD
FIG. 5



BALANCED 'H' PAD
FIG. 6

SOLVING SOME PROBLEMS IN

NETWORK DESIGN

The chart presented herein provides an easy and speedy means for determining the required resistance values for "T" and "H" pads without resorting to calculation

Sidney Bertram

THERE are three problems which arise in connection with networks used in public-address systems. These are:

1. To introduce a known attenuation into a balanced network without destroying the balance of the network.

2. To match two networks of unequal impedances, introducing a minimum amount of attenuation into the system.

3. To match two networks of unequal impedances and at the same time to introduce a known attenuation, greater than the minimum required for matching, into the system.

The solution of these problems ordinarily requires the use of complicated mathematics with which the average person is unfamiliar. Using the chart of Figure 1, any of these problems can be solved quickly and with a degree of accuracy that is sufficient for all ordinary purposes.

In order that the reader may become familiar with the use of the chart, several problems which are representative of the types that might occur in public-address work are solved here:

Case 1: To introduce a loss into a network where the end impedances are equal.

EXAMPLE: It is desired to introduce an attenuation of 10 decibels into a network of 200 ohms impedance (Figure 2).

1. The value of the shunt resistance R_c is found by drawing a line from the point on scale "A" equal to the line impedance Z_1 (200 ohms) through the point on scale "C" equal to the desired attenuation (10 decibels) to scale "F"; the reading at this point on scale "F" gives the value of the shunt resistance R_c (142 ohms).

2. The value of the series resistance R_a is found by drawing a line from the point on scale "A" equal to the line impedance Z_1 (200 ohms) through the point on scale "D" equal to the desired attenuation (10 decibels). The value where this line crosses scale "F" gives the value of the series plus shunt resistance ($R_a + R_c = 240$). Subtracting the value of R_c already found leaves the value of R_a desired (98 ohms).

3. R_b equals R_a (98 ohms).

Case 2. To match two networks of unequal impedances using a minimum loss pad (Figure 3).

EXAMPLE: To match a 20-ohm line to a 600-ohm line.

1. To find the minimum attenuation necessary to balance the network; draw a line from the point on scale "F" equal to the lower line impedance Z_1 (20 ohms) to the point on scale "A" equal to the higher line impedance Z_2 (600 ohms). Where this line crosses scale "E" the value of the minimum loss is read (20.7 decibels).

2. Find the $\sqrt{Z_1Z_2}$ (the mean value of the two line impedances) by drawing a line from the point on scale "F" equal to the lower line impedance Z_1 (20 ohms) through the point on scale "B" equal to the higher line impedance Z_2 (600 ohms) to scale "A." The value on scale "A" at this point gives the $\sqrt{Z_1Z_2}$ (110 ohms).

3. The value of the shunt resistance R_c is found by drawing a line from the point on scale "A" equal to the $\sqrt{Z_1Z_2}$ (110 ohms) through the point on scale "C" equal to the minimum loss (20.7 decibels). The reading where this line crosses scale "F" gives the value of R_c (20.5 ohms).

4. The value of the series resistance R_b is next found by drawing a line from the point on scale "A" equal to the higher line impedance Z_2 (600 ohms) through the point on scale "D" equal to the minimum loss (20.7 decibels) and continue this line to meet scale "F," the value of the series plus shunt resistance ($R_b + R_c = 600$ ohms). Subtracting the value of the shunt resistance ($R_c = 20$ ohms) leaves the value of the series resistance ($R_b = 580$ ohms).

Case 3: To match two networks of unequal impedances and at the same time to introduce a known attenuation into the network (Figure 4).

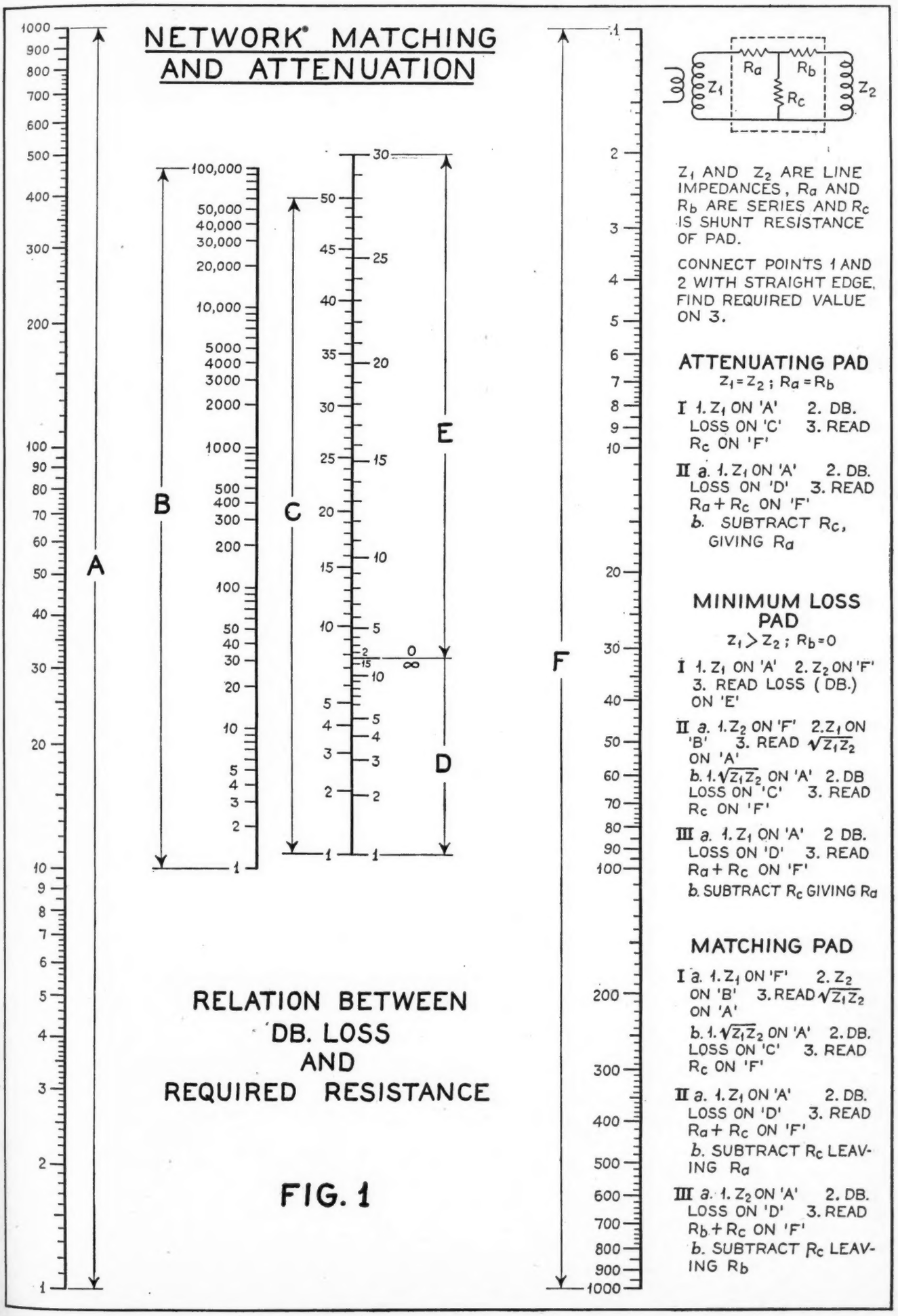
EXAMPLE: To match a 20-ohm line to a 600-ohm line and to introduce a total loss of 30 decibels into the network.

1. Find the $\sqrt{Z_1Z_2}$ by drawing a line from the point on scale "F" equal to the lower line impedance ($Z_1 = 20$ ohms) through the point on scale "B" equal to the higher line impedance ($Z_2 = 600$ ohms) and extend this line to meet scale "A," giving the desired value ($\sqrt{Z_1Z_2} = 110$ ohms).

2. To find the value of the shunt resistance R_c, draw a line from the point on scale "A" equal to the $\sqrt{Z_1Z_2}$ (110 ohms) through the point on scale "C" equal to the desired attenuation (30 decibels) and extend this line to meet scale "F," giving the value of R_c (7 ohms).

3. To find the value of the series resistance R_b, (*Turn to page* 118)

NETWORK® MATCHING AND ATTENUATION



RELATION BETWEEN DB. LOSS AND REQUIRED RESISTANCE

FIG. 1

Z_1 AND Z_2 ARE LINE IMPEDANCES, R_a AND R_b ARE SERIES AND R_c IS SHUNT RESISTANCE OF PAD.

CONNECT POINTS 1 AND 2 WITH STRAIGHT EDGE. FIND REQUIRED VALUE ON 3.

ATTENUATING PAD

$Z_1 = Z_2$; $R_a = R_b$

I 1. Z_1 ON 'A' 2. DB. LOSS ON 'C' 3. READ R_c ON 'F'

II *a.* 1. Z_1 ON 'A' 2. DB. LOSS ON 'D' 3. READ $R_a + R_c$ ON 'F'
b. SUBTRACT R_c, GIVING R_a

MINIMUM LOSS PAD

$Z_1 > Z_2$; $R_b = 0$

I 1. Z_1 ON 'A' 2. Z_2 ON 'F' 3. READ LOSS (DB.) ON 'E'

II *a.* 1. Z_2 ON 'F' 2. Z_1 ON 'B' 3. READ $\sqrt{Z_1 Z_2}$ ON 'A'
b. 1. $\sqrt{Z_1 Z_2}$ ON 'A' 2. DB LOSS ON 'C' 3. READ R_c ON 'F'

III *a.* 1. Z_1 ON 'A' 2 DB. LOSS ON 'D' 3. READ $R_a + R_c$ ON 'F'
b. SUBTRACT R_c GIVING R_a

MATCHING PAD

I *a.* 1. Z_1 ON 'F' 2. Z_2 ON 'B' 3. READ $\sqrt{Z_1 Z_2}$ ON 'A'
b. 1. $\sqrt{Z_1 Z_2}$ ON 'A' 2. DB. LOSS ON 'C' 3. READ R_c ON 'F'

II *a.* 1. Z_1 ON 'A' 2. DB. LOSS ON 'D' 3. READ $R_a + R_c$ ON 'F'
b. SUBTRACT R_c LEAVING R_a

III *a.* 1. Z_2 ON 'A' 2. DB. LOSS ON 'D' 3. READ $R_b + R_c$ ON 'F'
b. SUBTRACT R_c LEAVING R_b

SHORT-WAVE PAGE

DURING the last few weeks the most startling DX, with few exceptions, has been the logging and verifying of voice transmissions from stations operated by foreign amateurs. It really has been remarkable how many countries could be heard during a few hours of dial twirling when the listener concentrated his efforts on the 20-meter amateur band.

FOR the past year we have been listening with varying degrees of interest to the various *cadenes* who operate "full speed ahead" from early evening until the wee sma' hours of the morning. Spanish-speaking señoritas call their various "boy friends" as early (or should we say late?) as 3 a.m., and carry on "giggled" conversations which cause the writer to admit unblushingly he wished he understood Spanish. Now we have had the opportunity of logging amateur stations farther away than South America and in the majority of cases these "hams," whether they are in China, Spain or Switzerland, speak our own language, call our "W's" in perfect English. These foreign amateurs give their call letters slowly and distinctly, and, best of all, repeat them after each transmission. Another item in their favor (from the verification "hound's" point of view a very important one) is the prompt manner in which the foreign ham verifies American short-wave listeners' reports.

From all over the world the writer has received ham QSL cards, and we take a certain amount of pleasure in knowing that we have logged—and had verified—a 35-watt amateur station in South Africa, whose call is ZS1B. This station was logged twice. The letter which accompanied the card speaks for itself: "Your reports check up OK with my log. This is the first time my signals have been heard in the United States. I am on the air every evening from 15:45 to 16:30, G.M.T., and on Sunday mornings from 7:00 to 10:30, G.M.T. I give out the Bulletin of Division 1 of the South African Radio Relay League. My transmitter is a crystal-controlled outfit with a power input of 35 watts for telephone and 45 watts for c.w." The address of ZS1B is: P.O. Box 35, Capetown, South Africa.

We had barely recovered from this QSL "shock" when we received a card verifying our report of the amateur station in Ellice Islands. As our own words could not possibly explain in detail the "atmosphere" prevailing in this island located in the South Seas, we are going to give a description of the card. In one corner of this QSL, 192—is printed. This has had a line drawn through it and, in pencil, 1935 is written. These remarks follow: "DGK—call changed to VPIAJ, then VP1AJ, now VP3AJ. Only white family on Vaitupu, which is 6 miles long and ½ mile wide. Grows cocoanuts. Nearest white neighbors 70 miles. Mail every 4 to 6 months, *if lucky!* Plenty time to QSL, but you may have to wait for the post." That is that! Other amateurs whose veris have reached us are: CE3AG, OK1AW, ZS1H, ON4AU, and a score from Costa Rica, England and Cuba.

There are three active or standard short-wave broadcasting stations in Australia, but since the early part of the year a new "Aussie" has sprung to life on the ether waves and, principally due to the low power employed, listeners throughout the world call logging this VK real DX. The call letters are VK3ZX, and since the spring, this station has, in an effort to avoid code interference, changed their frequency to 7300 kc. At various times, Mr. Oliver G. Oppenheim, the station's owner and operator, has dedicated special programs to the Short-Wave Club of New York, and during one of these specials the writer was fortunate enough to log this 25-watt Aussie and send them an eighteen-minute report. The QSL card which arrived is all that any verification collector could desire. Try for this real catch on Sunday morning from 2:30 to 4:30 a.m., E.S.T., and send your report to Mr. O. G. Oppenheim, 33 Saturn Street, Caulfield, Victoria, Australia.

After much jumping about, the new Hong Kong, China, station has settled down on 8750 kc., deserting 5410 kc. for this higher and far more effective frequency. In the Eastern part of the United

(*Turn to page* 115)

Make It YOURSELF

Robert Hertzberg

A LOW-PRICED 7-tube "all-wave," band-switching superheterodyne that can be assembled by any radio fan or constructor has been brought out under the name "Eagle 7." This is supplied in complete kit form, with a ready formed and drilled chassis. A screwdriver, a pair of pliers and a soldering iron are about all the tools needed for the assembly job.

The circuit shown in Figure 1 comprises a 57 first detector, 56 oscillator, two 58 i.f. stages, 55 second detector, a.v.c. and first audio, 2A5 output tube and 80 rectifier. Sensitivity and selectivity are of fairly high order for a low-priced set; tone quality is excellent.

The tuning range, from 12 to 575 meters, is split into four bands: 12-35, 35-75, 75-200 and 200-575 meters. A separate beat-frequency oscillator is available for amateurs who intend to use the receiver for c.w. reception.

The "Eagle 7" was tested at the Westchester Listening Post and brought in many foreign stations on the short waves. On Band B, 160-meter amateurs, police stations and high-fidelity broadcasters were heard very well. On Band C a number of Canadian, Central American and South American 49-meter broadcasters came in. On Band D loudspeaker signals were obtained from Holland, England, Germany, France and Australia. Band A takes in the broadcast channels.

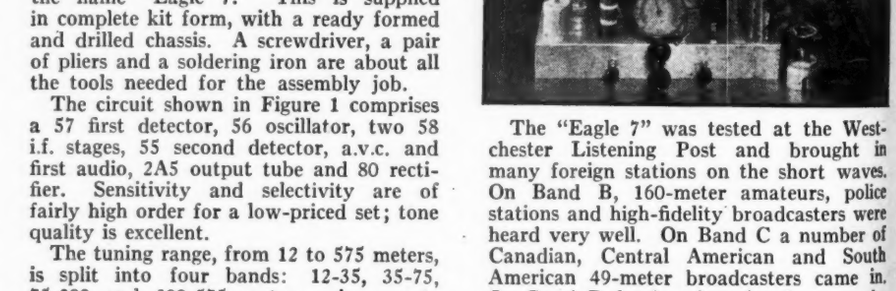


FIG. 1

Talking 12 MILES! *with* Flashlight Power

Ed. Glaser (W2BRB)

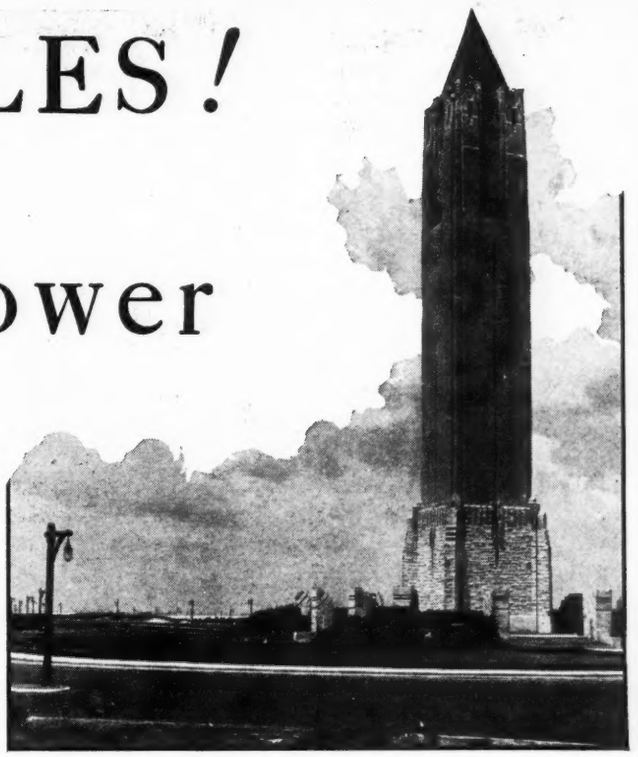
TWELVE-MILE voice communication on a wavelength of ¾ meter from a moving automobile was accomplished in the recent tests of the tiny combination microwave transmitter and receiver described last month—and this was dependable communication, free from ignition noise and, under ordinary conditions, marking another milestone in radio communication development.

Such were the results of this first set of tests carried on with this equipment, having a power rating about equal to that of an ordinary flashlight bulb. These tests do not by any means represent the maximum distance that can be worked with equipment of this type, but they do give an indication of its potential utility and practical value. More details of results are given later—but now for the tests themselves.—*The Editor.*

ARRANGEMENTS were made through the courtesy of Mr. A. K. Morgan, superintendent of Jones Beach State Park, to use the obelisk (water tower) that stands at the end of the Wantagh Causeway, about five miles from the mainland. This is the highest point for miles around, the peak of the tower being about 180 feet above ground and our platform and apparatus about 160 feet up.

At the open top of the huge water tank there are two catwalks with iron rails crossing at the center. On these rails we erected a platform on which to stand and mount the equipment. There were four windows available which led to four individual platforms or outside ledges on which were mounted floodlights for illuminating the pyramid top of the tower. This was the only place where we could mount the antennas so that's where they went. The windows were fitted with screens (to keep out the sea gulls!) but enough breeze came through the tower to blow your hat off, no matter what the style.

The writer made arrangements with Bill Volkommer, W2HO, president of the Nassau Radio Club of Oceanside, L. I., and some of the more ambitious members whom we will introduce later, to aid in this series of tests. At least a half dozen tests were planned but only four were made due to unforeseen incidents and bad weather. The first test was run at W2BRB, mainly to provide an opportunity for the gang to become familiar with the equipment and make whatever changes seemed desirable. One station was set up on the porch roof, about 15 feet above ground, the equipment consisting of the separate transmitter and receiver described in RADIO NEWS for May and June. The other station, which utilized the transceiver described last month, was located in a car. Directional antennae were used at both stations.



THE TEST TOWER

One of the test stations was installed in the top of this 180-foot water tower at Jones Beach—one of the major sea-side public park developments of the Long Island State Park Commission.

Two-way voice communication was carried on at a half mile or so and compared very favorably with 5-meter performance. Signals were absolutely steady, there being no evidence of any kind as to when the car was in motion. Although no suppressors were used, there was no ignition interference. The sparking could be heard but at such a low level that it was needless to bother with it. Probably this was largely due to the antenna location and its highly directional characteristics, it being pointed to the rear. At this very high frequency (400 mc.) there are no nodes and loops noticeable when changing location (when the car is moving) although these are very prominent, and the source of much annoyance, at 58 megacycles frequency (5 meters).

Up the Tower!

The second test turned out to be a hard day's work. We packed the car (and we mean *packed*) with two complete 75 cm. stations, one with a.c. equipment, the other with batteries; two complete 5 meter outfits, antennas for both, tools, lumber, wire, rope, lunches . . . and four fellows. The first job was to get the apparatus to the top, the top being at the end of a 150-odd-foot climb via ladder. A rope was dropped to ground level. The first load was tied on—and up it went, bump-bump, against the water tank. This went on for hours, more or less. After this, we assembled at the top. But we hadn't eaten! So we didn't build a platform—until we cleaned up as much as possible—of everybody's lunch—which was all but the boxes!

By this time we all realized that there wasn't to be very much done on 75 cm. this date, so we devoted our time to getting all set for the following week. Antenna mounts were prepared and the equipment set up. Everything seemed in working order so we thought of resting a bit by trying out the 5-meter rig, which was play. We brought along the 5-meter stuff mainly to talk to the car in the event the ¾-meter set didn't get through. With a type Q antenna inside the tower we heard—nothing! But as soon as it was stuck out the window—we would have thought we were listening to a broadcast receiver at night, excusing the quality, of course. The entire Metropolitan area was just roaring in and there were no dead spots on the dial. What a location!

The next test was held two weeks later. Bob Mautner, W2EDW, brought along his radio car with a real power 5-meter outfit. We all ascended the tower (just to limber up) and found the equipment in good shape (we thought). Then we split up and some of us manned the cars, the 75 cm. transceiver in one car, together with a 5-meter transceiver which Doc. Dunn, W2CLA, donated, and a telescoping Lynch radiator-cap antenna which Arthur Lynch, W2DKJ, donated, and we worked with the tower on both sets. Something was wrong with the tower 75 cm. transmitter, though, the signal being mushy and weak. After wasting a lot of time trying to make repairs, we decided on a one-way test talking from the car to the tower on 75 cm. and receiving the tower on 5 meters. This worked well, except that we had ignition interference on 5 meters while running. So W2EDW kept in touch with the tower on 5 meters and we rode along, getting (*Turn to page* 123)

S.W. PIONEERS

Official RADIO NEWS Listening Post Observers

LISTED below by states are the Official Radio News Short-Wave Listening Post Observers who are serving conscientiously in logging stations for the DX Corner.

United States of America

Alabama, J. E. Brooks, L. T. Lee, Jr., William D. Owens; **Arizona**, Geo. Pasquale; **Arkansas**, James G. Moore, Don Pryor; **California**, Eugene S. Allen, A. E. Berger, C. H. Canning, Earl G. DeHaven, G. C. Gallagher, Werner Howald, Wesley W. Loudon, Robert J. McMahon, Oriente I. Noda, Geo. C. Sholin, James E. Moore, Jr., Phil E. Lockwood, Hank G. Wedel, H. H. Parker; **Colorado**, Wm. J. Vette; **Connecticut**, H. Kemp, Geo. A. Smith, Philip Swanson, J. Herbert Hyde; Phillip R. Belt; **Florida**, James F. Dechart, George H. Fletcher, E. M. Law; **Georgia**, C. H. Armstrong, Guy R. Bigbee, James L. Davis, John McCarley, R. W. Winfree; **Idaho**, Bernard Starr, Lawrence Swenson; **Illinois**, E. Bergeman, Larry Eisler, Robert Irving, Charles A. Morrison, Phillip Simmons, Samuel Tolpin, Ray A. Walters, Floyd Waters, Robert L. Weber, J. Ira Young, Evert Anderson; **Indiana**, Freeman C. Balph, Arthur B. Coover, J. R. Flannigan, Henry Spearing, **Iowa**, J. Harold Lindblom; **Kansas**, C. W. Bourne, Wm. Schumacher; **Kentucky**, Geo. Krebs, Charles Miller, Wm. A. McAlister, James T. Spalding, W. W. Gaunt, Jr.; **Louisiana**, Roy W. Peyton; **Maine**, Danford L. Adams, M. Keith Libby, Vincent M. Wood, R. C. Messer; **Maryland**, Howard Adams, Jr., J. F. Fritsch, James W. Smith, August J. Walker, Forrest W. Dodge; **Massachusetts**, Armand A. Boussey, J. Walter Bunnell, Walter L. Chambers, Arthur Hamilton, Sydney G. Millen, Harold K. Miller, Elmer F. Orne, Roy Sanders, Donald Smith, Robert Loring Young; **Michigan**, Ralph B. Baldwin, Stewart R. Ruple, Jerry M. Hynek; **Minnesota**, M. Mickelson, E. M. Norris, Dr. G. W. Twomey; **Mississippi**, Mrs. L. R. Ledbetter, Dr. J. P. Watson; **Missouri**, C. H. Long; **Montana**, Henry Dobravalny; **Nebraska**, Hans Andersen, P. H. Clute, Harold Hansen, G. W. Renish, Jr.; **Nevada**, Don H. Townsend, Jr.; **New Hampshire**, Paul C. Atwood, Alfred J. Mannix; **New Jersey**, Wm. F. Buhl, Wm. Dixon, Morgan Foshay, George Munz, R. H. Schiller, Paul B. Silver, Earl R. Wickham; **New Mexico**, G. K. Harrison; **New York**, Donald E. Bame, John M. Borst, H. S. Bradley, Wm. C. Dorf, Capt. Horace L. Hall, Robert F. Kaiser, John C. Kalmbach, Jr., I. H. Kattell, W. B. Kinzel, Wm. Koehnlein, T. J. Knapp, A. J. Leonhardt, Joseph M. Malast, S. Gordon Taylor, Edmore Melanson, Joseph H. Miller, R. Wright, Harry E. Kentzel, Howard T. Neupert, A. C. Doty, Jr.; **North Carolina**, W. C. Couch, E. Payson Mallard, H. O. Murdoch, Jr.; **Ohio**, Paul Byrns, Charles Dooley, Stan Elcheshen, Albert E. Emerson, Samuel J. Emerson, R. W. Evans, Clarence D. Hall, William Oker, Donald W. Shields, C. H. Skatzes, Carl P. Peters, Orval Dickes; **Oklahoma**, H. L. Pribble, Robert Woods, W. H. Boatman; **Oregon**, Harold H. Flick, Geo. R. Johnson, James Haley, Ernest R. Remster, Ned Smith, Virgil C. Tramp; **Pennsylvania**, Oliver Amlie, Harold W. Bower, Roy L. Christoph, R. O. Lamb, John Leininger, Geo. Lilley, Edward C. Lips, Chas. Nick, Hen. F. Polm, C. T. Sheaks, K. A. Staats, F. L. Stitzinger, Walter W. Winand, J. B. Canfield; **Rhode Island**, Carl Schradieck, Joseph V. Trzuskowski; **South Carolina**, Edward Bahan, Ben F. Goodlett; **South Dakota**, Paul J. Mraz; **Tennessee**, Chas. D. Moss, Eugene T. Musser; **Texas**, James Brown, Heinie Johnson, Carl Scherz, Bryan Scott, James W. Sheppard, John Steward, Overton Wilson; **Utah**, Earl Larson, Harold D. Nordeen, A. D. Ross; **Vermont**, Eddie H. Davenport, Jos. M. Kelley, Dr. Alan E. Smith; **Virginia**, G. Hampton Allison, L. P. Morgan, D. W. Parsons, Gordon L. Rich, Gaines Hughes, Jr., E. L. Myers; **Washington**, Glenn E. Dubbe, A. D. Golden, Charles G. Payne; **West Virginia**, Kenneth R. Boord, R. E. Sumner; **Wisconsin**, Willard Hardell, Walter A. Jasiorkowski; **Wyoming**, L. M. Jensen, Dr. F. C. Naegeli; Eric Butcher.

Applications for Official Observers in the remaining States should be sent in immediately to the DX Corner.

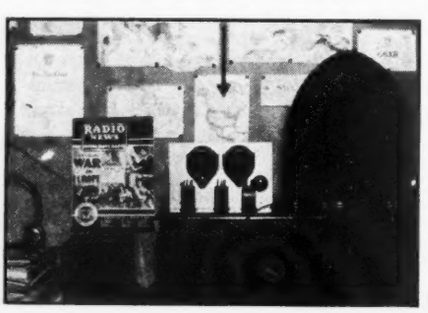
S. W. TIME SCHEDULE

LAURENCE M. COCKADAY

THE twenty-ninth installment of the DX Corner for Short Waves contains the World Short-Wave Time-Table for 24-hour use all over the world. The list starts at 01 G.M.T. and runs 24 hours through 00 G.M.T., right around the clock! This Time-Table contains a List of Short-Wave Stations, logged during the last month in the RADIO NEWS Westchester Listening Post (in our Editor's home), as well as at our official RADIO NEWS Short-Wave Listening Posts throughout the world. It provides an hour-to-hour guide to short-wave fans, whether experienced or inexperienced. The Time-Table shows the Call Letters, Station Locations, Wavelength and Frequency in the middle column. The column at the left gives the Times of Transmission in G.M.T. a.m., and the column at the right gives the Times of Transmission in G.M.T. p.m. The corresponding time in E.S.T. is also given and space has been left for filling in your own Local Time. The time, E.S.T., in the U. S. would be 8 p.m., E.S.T., for 01 G.M.T., as there is a five-hour difference. The time, E.S.T., for 13 G.M.T. would, therefore, be 8 a.m., E.S.T. These two features can be seen at the beginning of each outside column in the Time-Table. The times, C.S.T., for these two corresponding hours would be 7 p.m., C.S.T., and 7 a.m., C.S.T. The times, M.S.T., for the corresponding hours would be 6 p.m., M.S.T., and 6 a.m., M.S.T. The times, P.S.T., for corresponding hours would be 5 p.m. and 5 a.m., P.S.T. In this way American listeners can easily fill in their own Local Times at the top of the columns. Foreign listeners would probably prefer to use G.M.T., anyway, or, if not, can compute the time difference from G.M.T. and fill in their Local Time in each column head. At the end of the Time-Table is given a List of Symbols covering the various irregularities of transmission, etc.

A MODEL DX CORNER

Here is where G. C. Butler of Park Ridge, Illinois, spends his time hunting for short-wave DX stations. At the center (under the arrow) is his short-wave 2-tube receiver



Affiliated DX Clubs

We are hereby placing a standing invitation to reliable DX Clubs to become affiliated with the DX Corner as Associate Members, acting as advisers on short-wave activities, in promoting short-wave popularity and reception efficiency. A list of associate organizations follows: International DX'ers Alliance, President, Charles A. Morrison; Newark News Radio Club, Irving R. Potts, President, A. W. Oppel, Executive Secretary; Society of Wireless Pioneers, M. Mickelson, Vice-President; U. S. Radio DX Club, Geo. E. Deering, Jr., President; the Radio Club Venezolano of Caracas, Venezuela, President, Alberto Lopez; The World-wide Dial Club of Chicago, Illinois, President; Howard A. Olson; International 6000- to 12,500-Mile Short-Wave Club, Oliver Amlie, President, Joseph H. Miller, Vice-President.

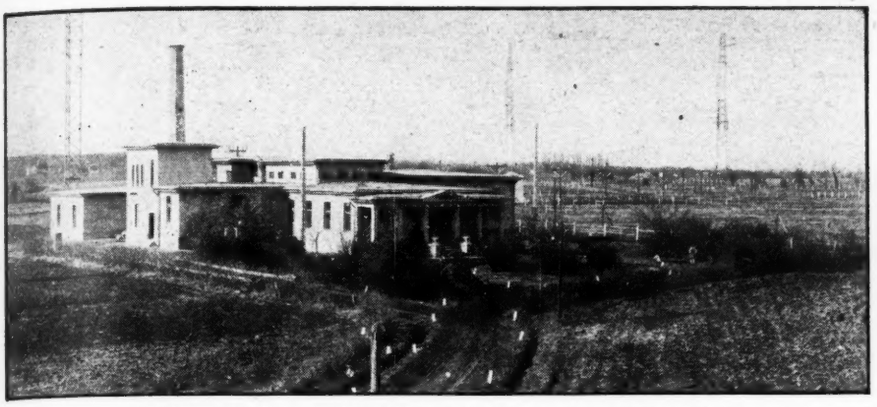
Any DX fan wishing to join any one of these Clubs or Associations may write for information to the Short-Wave DX Editor, and his letter will be sent to the organization in question. Other Clubs who wish to become affiliated should make their application to the Short-Wave DX Editor. Clubs associated with the DX Corner have the privilege of sending in Club Notes for publication in RADIO NEWS.

Your DX Logs Welcome

Please keep on sending in your information on any s.w. stations that you hear during the coming month, getting them in to the short-wave DX Editor by the 20th of the month. In this way you share your "Best Catches" with other readers and they, in turn, share with you, making for improved knowledge on short-wave reception. Also send in any corrections or additions that you can make to the short-wave identification charts, including station addresses, station slogans, station announcements, and any identifying signals the stations may have. Our Editors are doing the same thing, working with you day and night to bring you the best and most reliable short-wave information. Your logs are welcome and are sincerely invited.

Let's See Your DX Corner!

Readers are also invited to send in photographs or snapshots of themselves in their Listening Posts, for publication in the DX Corner. Let other readers see what you and your equipment look like! RADIO NEWS will pay $1.00 for each photo used, to help defray expenses. If a copy of RADIO NEWS appears in the photo, this payment will be doubled.



SHORT-WAVE STATION HAS-HAT AT BUDAPEST

Located in a large field are the transmitter buildings of the Budapest short-wave transmitters HAS, on 19.5 meters, and HAT, on 32.8 meters. The antenna system towers may be seen in the background

Listening Post Observers and Other Fans Please Notice

Listed on next column is this month's partial information regarding short-wave stations, heard and reported by our World-Wide Listening Posts. Each item in the listing is credited with the Observer's surname. This will allow our readers to note who obtained the information given. If any of our readers can supply actual Time Schedules, actual Wavelengths, correct Frequencies, or any other Important Information regarding these items, the DX Corner Editor and its readers will be glad to get the information. There are some hard stations to pull in in these listings, but we urge our Listening Posts and other readers to try their skill in logging the stations and getting correct information about them. When you are satisfied that you have this information correct, send it in to the editor; or if you have received a "veri" from any of the hard-to-get stations, send in a copy of the "veri" so that the whole short-wave fraternity may benefit. The list follows:

I2RO, Rome, Italy, 31.13 meters, 9635 kc., reported daily 2.30-5 p.m. E.S.T. Mon., Wed., and Fri., 6-7:30 p.m., and 7:45-9:15 p.m., E.S.T. On the 25.4 meter wavelength, 11810 kc., this station has been reported heard from 8-9 a.m., E.S.T. and from 9:15-10:15 a.m., E.S.T., and intermittently, for testing, during the afternoon hours. (Lussier, Coover, Anzalone, Hynek, Irving, Schradieck, Andrews, Myers, H. Adams, Krier, Wright, N. C. Smith, Suratt, Arickx, McCormick, Howald, H. L. Brown, Neupert, Kouyoumadjian, Styles, Bower, Libby.)

EAQ, Madrid, Spain, now reported on the air daily 22:15-00:30 G.M.T. and Saturdays from 17-19 G.M.T. (J. E. Moore.)

CT1AA, Lisbon, Portugal, is now on the air one hour earlier than in the winter, signing off at 6 p.m. (Dalal, Bower, Winand.) This station was reported heard on 25 meters 21.30 to 24 G.M.T. (Lussier.)

FYA, Pontoise, France, is reported to have been licensed to use new waves soon. They are as follows: 13.95 meters, 21490 kc; 16.88 meters, 17765 kc; 19.6 meters, 15295 kc; 25.3 meters, 11845 kc; 31.27 meters, 9585 kc; 48.8 meters, 6145 kc. Keep your eyes (and ears) open for these new transmissions and try to get their schedules. (Bower.)

PI1J, Dordrecht, Holland, 7082 kc., on the air 16:10-17:10 G.M.T. (Westchester.)

CSL, Lisbon, Portugal, reported heard from 7 p.m., G.M.T. onward. (Johnson.)

Emisora Invicta-Radio, Ida., Porto, Portugal, 51.79 meters, heard testing. (Mascarenbas.)

DIQ, Germany, 10285 kc., 5:05-6 p.m. E.S.T. (Chambers.)

DJQ, Zeesen, Germany, 19.63 meters, 17-21:30 G.M.T. (Self.)

DJR, Zeesen, Germany, 15340 kc., heard 4-4:30 p.m., E.S.T., with programs to Africa. (Myers.)

LKJ1, Oslo, Norway, reported on 9568 kc., 5-8 a.m., and 11 a.m.-6 p.m., E.S.T. (Capt. Hall).

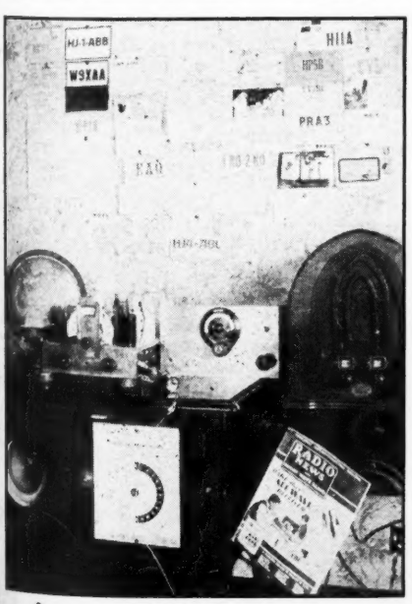
HBL, Geneva, Switzerland, reported heard on 9580 kc., at 1.45 a.m., E.S.T., Mondays, for the summer only. (Dodge) Messrs. Libby, Cassidy report new wavelength 31.4 meters, 9550 kc.

HBJ, Geneva, Switzerland, reported heard on 14550 kc., 3-4 p.m., E.S.T. (Myers.)

(*Turn to page* 98)

RADIO NEWS "CHOCK FULL" OF INTERESTING MATERIAL

That is what M. L. Gavin, newly appointed Observer for Ohio, says about "our own" magazine. His DX Corner is shown below. The set on the right is a 5-tube Majestic and on the left is a 5-tube short-wave set, with a band-spread set located in the center



S.W. PIONEERS
Official RADIO NEWS Listening Post Observers

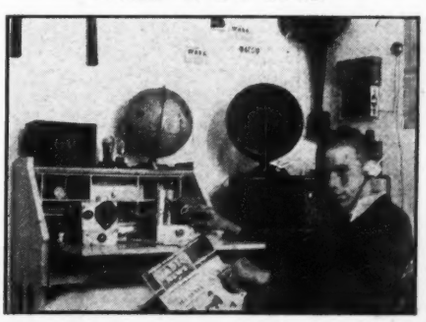
LISTED below by countries are the Official RADIO NEWS Short-Wave Listening Post Observers who are serving conscientiously in logging stations for the DX Corner.

Alaska, Thomas A. Pugh.
Argentina, J. F. Edbrooke.
Australia, Albert E. Faull, A. H. Garth, H. Arthur Matthews, C. N. H. Richardson, R. H. Tucker.
Belgium, Rene Arickx.
Bermuda, Thursten Clarke.
Brazil, W. W. Enete, Louis Rogers Gray.
British Guiana, E. S. Christiani, Jr.
British West Indies, E. G. Derrick, Edela Rosa, N. Hood-Daniel.
Canada, J. T. Atkinson, A. B. Baadsgaard, Jack Bews, Robert Edkins, W. H. Fraser, Fred C. Hickson, C. Holmes, John E. Moore, Charles E. Roy, Douglas Wood, Claude A. Dulmage, A. Belanger.
Canal Zone, Bertram Baker.
Canary Islands, Manuel Davin.
Central America, R. Wilder Tatum,
Chile, Jorge Izquerdo.
China, Baron Von Huene.
Colombia, J. D. Lowe, Italo Amore.
Cuba, Frank H. Kydd, Dr. Evelio Villar.
Czechoslovakia, Ferry Friedl.
Denmark, Hans W. Priwin.
Dominican Republic, Jose Perez.
Dutch East Indies, E. M. O. Godee, A. den Breems, J. H. A. Hardeman.
Dutch West Indies, R. J. van Ommeren.
England, N. C. Smith, H. O. Graham, Alan Barber, Donald Burns, Leslie H. Colburn, Frederick W. Cable, C. L. Davies, Frederick W. Gunn, R. S. Houghton, W. P. Kempster, R. Lawton, John J. Maling, Norman Nattall, L. H. Plunkett-Checkemian, Harold J. Self, R. Stevens, L. C. Styles, C. L. Wright, John Gordon Hampshire, J. Douglas Buckley, C. K. McConnon, Douglas Thwaites, J. Rowson, A. J. Webb.
France, J. C. Meillon, Jr., Alfred Quaglino.
Germany, Herbert Lennartz, Theodor B. Stark.
Hawaii, O. F. Sternemann.
India, D. R. D. Wadia, A. H. Dalal.
Irish Free State, Ron. C. Bradley.
Iraq, Hagop Kouyoumdjian.
Italy, A. Passini, Dr. Guglielmo Tixy.
Japan, Massall Satow.
Malta, Edgar J. Vassallo.
Mexico, Felipe L. Saldana, Manuel Ortiz Gomez.
New Zealand, Dr. G. Campbell Macdiarmid, Kenneth H. Moffatt.
Norway, Per Torp.
Panama, Albert Palacio.
Philippine Islands, Victorino Leonen.
Portugal, Jose Fernandes Patrae, Jr.
Puerto Rico, Manuel F. Betances, A. N. Lightbourn.
Scotland, Duncan T. Donaldson.
South Africa, Mike Kruger, A. C. Lyell, H. Mallet-Veale, C. McCormick.
Spain, Jose Ma. Maranges.
Sweden, B. Scheierman.
Switzerland, Dr. Max Hausdorff, Ed. J. DeLopez.
Turkey, Herman Freiss, M. Seyfeddin.
Venezuela, Francisco Fossa Anderson.

Applications for Official Observers in the remaining countries should be sent in immediately to the DX Corner.

"IT'S THE BEST EVER"

Another sincere tribute to RADIO NEWS *from an ardent short-wave fan who is an old hand at the game although only 15 years of age. His various short-wave sets are shown scattered around his DX Corner*



WORLD SHORT WAVE TIME-TABLE

Compiled by LAURENCE M. COCKADAY

Hours of transmission for the World's Short Wave Broadcast Stations

												FILL IN LOCAL TIME												
8	9	10	11	M	1	2	3	4	5	6	7	EASTERN STANDARD TIME	8	9	10	11	N	1	2	3	4	5	6	7
01	02	03	04	05	06	07	08	09	10	11	12	GREENWICH MEAN TIME	13	14	15	16	17	18	19	20	21	22	23	00

HOURS OF TRANSMISSION	*Wave-length Meters*	*Call Letters*	*Frequency Kc.*	*City Country*	HOURS OF TRANSMISSION
	13.9+	W8XK	21540	Pittsburgh, Pa.	
	13.9+	GSH	21470	Daventry, England	
	16.8+	GSG	17790	Daventry, England	
	16.8+	W3XAL	17780	Bound Brook, N. J.	
	16.8+	PHI	17775	Huizen, Holland	
	16.8+	DJE	17760	Zeesen, Germany	
	19.4	PRADO	15440	Riobamba, Ecuador	
	19.5	HAS3 (HAS)	15370	Budapest, Hungary	
	19.5	W2XAD	15330	Schenectady, N. Y.	
	19.6+	DJQ	15280	Zeesen, Germany	
	19.6+	W2XE	15270	New York, N. Y.	
	19.6+	GSI	15260	Daventry, England	
	19.6+	FYA	15243	Pontoise, France	
	19.7	PCJ	15220	Huizen, Holland	
	19.7	W8XK	15210	Pittsburgh, Pa.	
	19.7	DJB	15200	Zeesen, Germany	
	19.8	GSF	15140	Daventry, England	
	19.8	HVJ	15123	Vatican City	
	19.9+	RKI	15040	Moscow, U.S.S.R.	
	22.4+	YVQ	13340	Maracay, Venezuela	
	22.7+	ORP	13200	Ruysselede, Belg.	
	22.9+	VP1A	13080	Suva, Fiji Islands	
	24.1+	CT1GO	12396	Parede, Portugal	
	24.8+	CT1CT	12082	Lisbon, Portugal	
	24.9+	RW59	12000	Moscow, U.S.S.R.	
	25.2	FYA	11891	Pontoise, France	
	25.2+	W8XK	11870	Pittsburgh, Pa.	
	25.2+	GSE	11860	Daventry, England	
	25.3+	W2XE	11830	New York, N. Y.	
	25.4	I2RO	11810	Rome, Italy	
	25.4+	W1XAL	11790	Boston, Mass.	
	25.4+	DJD	11770	Zeesen, Germany	
	25.5+	GSD	11750	Daventry, England	
	25.5+	FYA	11725	Pontoise, France	
	25.5+	CJRX	11720	Winnipeg, Canada	
	25.6+	HJ4ABA	11710	Medellin, Col.	
	27.9+	JVM	10740	Nazaki, Japan	
	28.1+	JVN	10660	Nazaki, Japan	
	28.3+	FYB	10578	Paris, France	
	28.9+	LSX	10350	Buenos Aires, Argen.	
	29.0+	ORK	10330	Ruysselede, Belgium	
	29.3+	CO9WR	10200	SanctusSpiritus, Cuba	
	30.4+	EAQ	9860	Madrid, Spain	
	31.1+	I2RO	9635	Rome, Italy	
	31.2+	CT1AA	9600	Lisbon, Portugal	
	31.2+	W3XAU	9590	Philadelphia, Pa.	
	31.2+	VK2ME	9590	Sydney, Australia	
	31.2+	HP5J	9590	Panama City, Pana.	
	31.3	HBL	9580	Geneva, Switzerland	
	31.3	VK3LR	9580	Lyndhurst, Victoria, Australia	
	31.3	GSC	9580	Daventry, England	
	31.3+	LKJ1	9572	Jeloy, Norway	
	31.3+	W1XK	9570	Springfield, Mass.	
	31.3+	VUB	9565	Bombay, India	
	31.3+	DJA	9560	Zeesen, Germany	
	31.4+	DJN	9540	Zeesen, Germany	
	31.4+	W2XAF	9530	Schenectady, N. Y.	
	31.5+	VK3ME	9510	Melbourne, Australia	
	31.5+	GSB	9510	Daventry, England	
	31.5+	PRF5	9501	Rio de Janeiro, Braz.	
	31.8	COH	9428	Havana, Cuba	
	31.8+	PLV	9415	Bandoeng, Java	
	32.8+	HAT4	9125	Budapest, Hungary	
	33.0+	TFK	9060	Reykjavik, Iceland	
	35.6+	HC2AT	8400	Guayaquil, Ec.	
	36.4+	ZP10	8220	Asuncion, Paraguay	
	36.5	HCJB	8214	Quito, Ecuador	
	38.2+	HC2JSB	7830	Guayaquil, Ecuador	
	38.4+	HBP	7790	Geneva, Switzerland	
	35.5	YNLF	7788	Managua, Nicaragua	
	40.4+	HJ3ABD	7406	Bogota, Colombia	
	40.6+	XECR	7380	Mexico City, Mex.	
	41.1+	HJ1ABD	7281	Cartagena, Col.	
	41.7+	CR6AA	7177	Lobito, Angola, Port. West Africa	
	42.0	HJ4ABB	7138	Manizales, Col.	
	42.0+	HKE	7130	Bogota, Col.	
	42.1+	HB9B	7118	Basle, Switzerland	
	42.3+	PI1J	7082	Dordrecht, Holland	
	42.8+	LKJ1	6990	Jeloy, Norway	
	43.4+	HI3C	6900	La Romana, D. R.	
	44.0	HIH	6818	San Pedro, D. R.	
	44.4+	JVT	6750	Nazaki, Japan	
	44.6+	TIEP	6710	San Jose, Costa Rica	
	45.0+	HC2RL	6668	Guayaquil, Ecuador	
	45.3	PRADO	6616	Riobamba, Ecuador	
	45.3+	RW72	6611	Moscow, U.S.S.R.	
	45.9+	YV6RV	6520	Valencia, Ven.	
	46.2	HJ5ABD	6490	Cali, Colombia	
	46.2+	HI4D	6482	San Domingo, D. R.	
	46.5+	HJ1ABB	6447	Barranquilla, Col.	
	46.8+	YN1GG	6400	Managua, Nicaragua	

WORLD SHORT WAVE TIME-TABLE

(*Continued from the Previous Page*)

Hours of transmission for the World's Short Wave Broadcast Stations

												FILL IN LOCAL TIME												
8	9	10	11	M	1	2	3	4	5	6	7	EASTERN STANDARD TIME	8	9	10	11	N	1	2	3	4	5	6	7
01	02	03	04	05	06	07	08	09	10	11	12	GREENWICH MEAN TIME	13	14	15	16	17	18	19	20	21	22	23	00

Wavelength Meters	Call Letters	Frequency Kc.	City Country	HOURS OF TRANSMISSION
46.8+	YV9RC	6400	El Valle, Venezuela	D D D
47.0	YV4RC	6375	Caracas, Venez.	Sa Sa Sa
47.4+	HIZ	6315	San Domingo, D. R.	XS XS D
47.7+	HJ3ABF	6275	Bogota, Colombia	L L L
48.1+	OAX4B	6230	Lima, Peru	AM
48.1+	HJ4ABC	6230	Pereira, Col.	XY
48.1+	HJ1ABH	6225	Cienaga, Col.	D D I I I
49.8+	CT1GO	6198	Parede, Portugal	D D D D
48.4+	HI1A	6188	Santiago de Los Caballeros, D. R.	D D
48.7+	CJRO	6160	Winnipeg, Manitoba	D D
48.7+	HJ2ABA	6150	Tunja, Colombia	D D D
48.7+	YV3RC	6150	Caracas, Venezuela	Sa Sa
48.7+	VE9CL	6150	Winnipeg, Man.	XR XR
48.7+	HJ5ABC	6150	Cali, Colombia	D D D M M
48.7+	CSL	6150	Lisbon, Portugal	D D D D D
48.7+	CO9GC	6150	Santiago, Cuba	AE AE
48.8+	W8XK	6140	Pittsburgh, Pa.	D D I I I I D D
48.9	ZGE	6132	Kuala Lumpur F. M. S.	D D D
49.0+	W2XE	6120	New York, N. Y.	Sa D D
49.0+	PKVDA2	6120	Bandoeng, Java	XS Sa D S
49.0+	HRP1	6115	San Pedro Sula, Honduras	AL AL XS XS R
49.0+	HJ1ABE	6115	Cartagena, Col.	D D
49.0+	YV2RC	6112	Caracas, Ven.	XS XS
49.0+	VE9HX	6110	Halifax, N. S.	K K I I I I
49.0+	GSL	6110	Daventry, England	D I I I I I
49.0+	VUC	6109	Calcutta, India	AG AG T
49.1+	W3XAL	6100	Bound Brook, N. J.	D D D D D XS D
49.1+	W9XF	6100	Chicago, Ill.	Sa Sa
49.1+	HJ4ABL	6100	Manizales, Col.	D D D
49.1+	ZTJ (JB)	6098	Johannesburg, Africa	XS XS XS Sa
49.1+	VE9GW	6090	Bowmanville, Can.	D D D
49.3+	CP5	6080	La Paz, Bolivia	D D D D D D D
49.3+	W9XAA	6080	Chicago, Ill.	Th Th S S N N
49.3+	ZHJ	6080	Penang, Straits Settlements	T T I Sa Sa D D D D
49.3+	DJM	6073	Zeesen, Germany	S S S S
49.3+	CQN	6073	Macao, Asia	D D D D D D D D D D
49.3+	OER2	6072	Vienna, Austria	XA XA E E D D D XS
49.3+	VE9CS	6070	Vancouver, B. C.	D D D D D D D D D D
49.3+	HJ1ABF	6070	Barranquilla, Col.	S S D D D D D D D
49.4+	VQ7LO	6060	Nairobi, Kenya, Afr.	D D D D D D D D D D
49.4+	W8XAL	6060	Cincinnati, Ohio	S S D D D D D D D D
49.4+	W3XAU	6060	Philadelphia, Pa.	XS S S S S S XS
49.4+	OXY	6060	Skamlebaek, Den.	D D D D D D D D
49.5+	GSA	6050	Daventry, England	T
49.6+	HJ1ABG	6042	Barranquilla, Col.	XS XS XS D D D D S S D
49.6+	PRA8	6040	Pernambuco, Brazil	D D D D D D D D D D
49.7+	HP5B	6030	Panama City, Pan.	N N
49.7+	VE9CA	6030	Calgary, Alberta, Can.	D D D D D D D D D D
49.8	DJC	6020	Zeesen, Germany	D D D D D D D D D D
49.8+	ZHI	6018	Singapore, Malaya	D D D D D D D D D D
49.8+	HJ3ABH	6012	Bogota, Col.	D D D D D D D D D D
49.8+	COC	6010	Havana, Cuba	D D D D D D D D D D
49.8+	XEBT	6010	Mexico City, Mex.	D D D D D D D D D D
49.9+	VE9DN	6005	Montreal, Canada	D D D D D D D D D D
49.9+	TGWA	6000	Guatemala City	D D D D D D D D D D
49.9+	RW59	6000	Moscow, U.S.S.R.	D D D D D D D D D D
50.1+	CT1AA	5980	Lisbon, Portugal	D D D D D D D D D D
50.1+	HIX	5980	San Domingo, D. R.	D D D D D D D D D D
50.1+	XECW	5975	Xantocam, Mexico	D D D D D D D D D D
50.2+	HVJ	5969	Vatican City	D D D D D D D D D D
50.3+	HJ1ABJ	5950	Santa Marta, Col.	D D D D D D D D D D
50.4+	TG2X	5940	Guatemala City	D D D D D D D D D D
50.5+	HJ4ABE	5930	Medellin, Colombia	D D D D D D D D D D
50.8+	HJ2ABC	5900	Cucuta, Colombia	D D D D D D D D D D
51.1+	HI1J	5860	San Pedro de Macoris, D. R.	D D D D D D D D D D
51.2+	YV5RMO	5850	Maracaibo, Venez.	XS XS XS XS XS XS
51.4+	TIXGP3	5823	San Jose, Costa Rica	XS XS XS XS XS XS
51.8+	OAX4D	5780	Lima, Peru	AN AN AN AN AN AN
52.7	FIQA	5692	Tananarive, Mad.	D D XS Sa Sa S
64.5+	HC2EP	4650	Guayaquil, Ecuador	D D D D D D D D D D
69.5	YNLF	4316	Managua, Nicaragua	L L Th
70.2	RW15	4273	Khabarovsk, Siberia	S AC AC AC
74.9+	CT2AJ	4002	San Miguel, Azores	Th
79.5+	HB9B	3770	Basle, Switzerland	
79.9+	CT1CT	3750	Lisbon, Portugal	
84.6+	CR7AA	3543	Lourenzo Marques, Mozambique	
85.0+	HB9AQ	3525	Switzerland	

A—Sunday, Winter only
B—Sunday, Monday, Wednesday, Friday
C—Monday, Wednesday, Friday
D—Daily
E—Tuesday, Thursday
G—Tuesday, Thursday, Saturday
I—Irregularly
J—Thursday, Friday, Saturday, Sunday
K—Monday, Friday
L—Wednesday, Saturday
M—Monday
N—Monday, Wednesday, Thursday
O—Monday, Tuesday, Wednesday, Friday
P—Except Tuesday, Wednesday
R—Thursday, Friday, Saturday
S—Sunday
T—Tuesday
Th—Thursday
U—Sunday, Summer only
V—Wednesday, Sunday
Z—Tuesday, Friday
AC—Monday, Thursday, Saturday
AD—Time at 20 GMT
AE—Tuesday, Friday, Sunday
AG—Tuesday, Sunday
AH—Time at 7:30 GMT
AK—Wednesday, Thursday, Friday, Saturday
AL—Except Monday, Sunday
AM—Monday, Thursday
AN—Tuesday, Saturday
Sa—Saturday
XA—Except Saturday, Sunday
XF—Except Friday
XM—Except Monday
XR—Except Thursday, Saturday
XS—Except Sunday
XSa—Except Saturday
XX—Tuesday, Thursday, Friday
XY—Except Tuesday, Sunday
XZ—Except Sunday, Monday

NEW PARAGUAYAN STATION

This is the new station being heard on the air from Asuncion. Its amateur call is ZP3AC, but when used for broadcasting its call is ZP10. It is owned by Julio Rodriguez Leguizamon (shown in "whites") and operates on 8220 kc. His three visitors are, from left to right: Elias Nararro, ZP7AB; Gernando Artaza, ZP9; Federico Donna, ZP4AB

The DX Corner (Short Waves)

(*Continued from page* 95)

RW59, Moscow, USSR, reported on 12 megacycles, Sundays, 8-9 a.m., E.S.T. with special Swedish programs, (Baron von Huene). This station has been heard, lately, almost every afternoon, from at least 1-5 p.m., E.S.T., especially on Saturdays. It has talks in English on Mondays, Wednesdays, and Fridays. (McCormick, Libby, Chambers) Soviet Russia is building a new 120 kw., short-wave station. Listen for it. (Styles, Spearing.)

ZHI, Singapore, FMS, is heard well at 10:30 G.M.T., closing down at 13:10 G.M.T. (Matthews.)

ZBW, Hongkong, China, reported heard at 9.09 megacycles, 6-9 a.m., E.S.T. (Gallagher.)

ZCK, Hongkong, China, reported on 8750 kc., and also on 5410 kc., daily 11:30 p.m. to 1:15 a.m., E.S.T. On Mondays and Thursdays they are reported on the air 3-7 a.m., E.S.T. Tues., Weds., and Fris., they are reported from 6-10 a.m. E.S.T., Station announcements in English (Kinzel.)

XGW, Shanghai, China, reported testing on 4.6 megacycles, 6-8 a.m., E.S.T. (McMahon).

ZGE, Kuala Lumpur, F.M.S., 6130 kc., reported heard Tues., Fris., and Suns., 11:40-13:40 G.M.T. (Rogers).

POJ, Dutch East Indies, 15.22 megacycles, reported heard daily, except Tuesdays, 6:15-9:15 p.m., E.S.T. (McMahon.)

PMA, Malabar, Java, 15.4 megacycles, reported heard 9:30-10:30 p.m., E.S.T. (Munz.)

VUB, Bombay, India, threatens to go off the air unless they get more reports from listeners. Whoop her up boys! (Ross.) This station transmits on 31.39 meters and is reported heard best from 11.30 a.m., to 12.30 p.m., E.S.T., Tuesdays and Fridays. (Spearing.)

JVF, Nazaki, Japan, 15620 kc., reported heard talking to KWU and playing music from 4:45-5 p.m., E.S.T. daily. (Coney.)

JVM, 10740 kc., **JVN,** 10660 kc., **JIB,** 10530 kc., **JVF,** 15610 kc., **JVL,** 11660 kc., are reported as the best Japs heard recently. (Jensen, Ross, Gallagher, Polm.)

VP1A or **(VPD),** both calls are correct, 13075 kc. reported heard Tues. and Sats. 12:30 p.m. to 1:30 a.m., and also Mon. Wed. Thur. and Sats, 12-1 a.m., and regularly as late as 3 a.m. E.S.T. (Je. E. Moore, We White, Kinzell, Sholin, Gallagher.)

CR7AA, Lourenzo Marques Porteugese East Africa, 84.67 meters, 3543 megacycles, 150 watts reported heard Mon, Thur, and Sats. 6:30 to 8:30 p.m., G.M.T. (Baadsgaard.)

CR6AA, Lobito, Port. East Africa, 7177 kc reported heard Wed. and Sat. 19.45 to 21.45 G.M.T.

VQ7LO, Nairobi, East Africa, 6060 kc., schedule reported Mon., Tues., Wed., Thurs. and Fri. 10.45 to 11:15 G.M.T. and 4:40 to 7:30 p.m. G.M.T. and Tues. and Thurs. 1.30 to 2:30 p.m., G.M.T. Sat. 4:30 to 8 p.m. E.S.T. and Sun. 4 to 7 p.m., G.M.T. This station will verify only if name or music or record number is given, with exact time received and full reports are requested not meager ones. Station will not DX for short-wave listeners in America until it is convinced station can be heard here. (Bigby, McMahon.)

ZTJ, (JB), Johannesburg, South Africa, is reported operating on 49.2 meters—6097.56 kc., (Mallet-Veal). This Listening Post Observer says call letters really are ZTJ (for both long wave and short wave) and that the call "JB" is a nickname for the Short-Wave stations, used for "Johannesburg".

VK3ZX, is a Melbourne amateur, G. C. Bryce, 501 Royal Parade, Parkville, N-2, Melbourne, Vic. Australia. He tests on 40 meters band, with music. (Mathews). Mr. Mathews reports W8XAL, from 12 p.m. G.M.T. onwards, WXK, on 25 meters and 48 meters, G.M.T. onwards and W1XK

IN FAR-OFF TURKEY

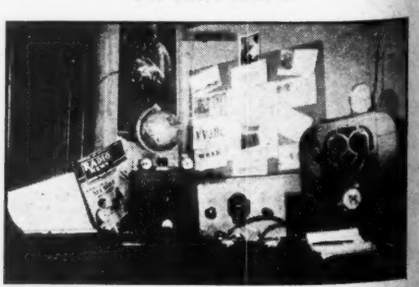
Meet Official Observer Herman Freiss of Istanbul, who not only observes short-wave phenomena for RADIO NEWS, *but reads it from cover to cover. He is the first person in Turkey to receive a verification from the Japanese Station JVM*

OFFICIAL OBSERVER FOR PENNSYLVANIA

Unless we are mistaken, here is our old friend Walter W. Winand in his DX Corner, seated at his 10-tube superheterodyne

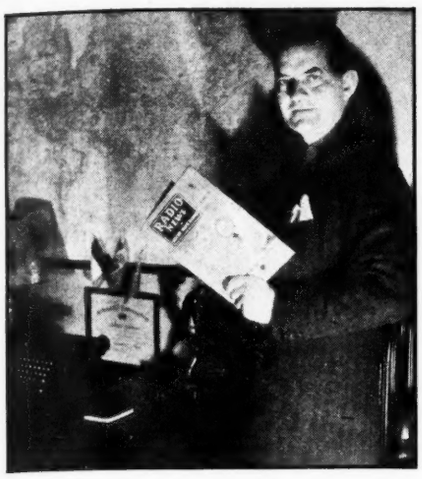
LISTENING POST FOR ALABAMA

This is the DX Corner of William D. Owens of Huntsville, Alabama, Official Observer for RADIO NEWS *on the short waves*



Stop-Press Item!

JUST received, before going to press: news that there will be a special transmission, dedicated to RADIO NEWS and the International DX'ers Alliance, Saturday, July 13th, from Station PLV, Bandoeng, Java, on 31.86 meters, antenna directed to San Francisco, power 40 kw., time of transmission—15-15:30 GMT (10-10:30 a.m. EST). Program was organized by O.R.N.S.W.L.P.O. for Dutch East Indies, J. H. Hardeman. Here is an excellent chance to get a fine veri!



OBSERVER FOR FRANCE

Here is Alfred Quaglino, at a corner of his listening post, in Juan-les-Pins. Yes, he is another one of those many thousands of short-wave enthusiasts who look for new dope in RADIO NEWS

(old W1XAZ) and VE9GW at about 13.00 G.M.T. and W2XAF around 11.00 G.M.T. are the best American stations received in Australia at these times. He also reports station JVM is the best Japanese station heard in Australia from about 09.00 G.M.T. onwards.

VK3ME, Melbourne, Australia, will read out loud, Wed. 6 to 6:15 a.m., E. S. T., names, states and countries of fans sending reports for "veries." (Amlie).

VIY, Melbourne, Australia, 24.9 meters heard rebroadcasting to Canada and England, 6 to 7 p.m. E.S.T. (Kinzel).

VK3LR, Lyndhurst, Australia, reported heard Sat. nights 12:30 to 2:30 a.m. with programs from Melbourne racetrack. (Flick, Young, Gallagher, Moffat).

W2XAD, W1XK and **W2XAF** and **W8XK** are the best North American stations, reported by L. P. O. Arickx, in Belgium.

KKQ, 12350 kc., reported heard rebroadcasting NBC programs to Honolulu 9:45 p.m. E.S.T. (Peters).

(*Turn to page* 120)

CLUB NEWS

The United States Radio DX Club News

The new DX report forms for this Club are completed and they may be obtained by members for 30 cents a hundred. Members of the Club who have seen the report forms state that they are the best they have seen.

Your President, G. Deering, Jr., contributes the following: Fooling around on short waves I came across the lighthouse stations on 3.41 megacycles. I sent in a report and have received a verie which reads as follows: "This will verify your reception of WWDI, WWDW, WWEC, also WWHJ which is aboard the tender *Lilac* which patrols the Delaware River Bay. WWDI is Edgemoor Light at Edgemoor, Delaware. WWDW is the Bank Light Station in Delaware Bay. WWEC is the Delaware Breakwater Light Station near News, Delaware. All of these stations transmit daily at 10 p.m., 1 p.m., 4 p.m. and 8 p.m. on 3140 kc. with 50 watts power."

We hereby welcome three new members to the Club: Kieran Kelty of CJLS, Yarmouth, N. S.; S. M. Krohn, Jr., of WSMK, Dayton, Ohio, and D. E. Bennett of KTG, Alamaso, Colorado.

Howard Morse, Secretary and Treasurer of the Club, wishes to thank all members for their contribution to the DX Recorder: "I wish to thank our President and Mr. Swenson for their assistance as well as the Globe Circlers' DX Club, the New England Radio Club, The Universal Radio DX Club, the National Radio Club, Mid-Co Exchange, I.D.A. and RADIO NEWS for their splendid cooperation."

Indian Radio Amateurs' League

This is a new League, formed in India, with our old friend D. R. D. Wadia as President. The League is entirely non-commercial and the ownership of the property of the League is fixed in its members. The amount of membership dues is Rs 5/–. It was formed to aid and assist radio amateurs regarding radio matters. Qualifications necessary for enrollment consist simply of a genuine interest in radio and the possession of a receiver or a transmitter is desirable. Any letters of inquiry will be forwarded to the League by RADIO NEWS.

Globe Circlers' DX Club

The Publicity Manager for the Globe Circlers' DX Club has written to us regarding news of that association and we hereby invite this Club to become associated with the DX Corner and to send in monthly news to us.

Radio Club Venezolano

The Radio Club Venezolano invites interested short-wave fans to write in to its Secretary, c/o RADIO NEWS, regarding membership in this well-known South American radio organization.

Announcing a New Short-Wave Association

We wish to announce the opening of the Radio and Short-Wave Experimenters Association, newly formed for out-of-town membership. The Association is non-commercial and complete information may be obtained by writing to the Editor of this Department asking that your letter be forwarded. An invitation to become associated with the DX Corner of RADIO NEWS has been forwarded to this club.

World-Wide Dial Club, Chicago, Illinois

The World-Wide Dial Club held a very successful dance and meet at the Hotel Morrison during the month of July, at which a number of very fine prizes were given. It is with regret that this information did not reach RADIO NEWS in time for its cooperation in the festivities. It is one of Chicago's foremost short-wave radio clubs and meetings are held at the Hotel Morrison on the 1st and 3rd Tuesday of each month at 8 p.m. Short-wave fans who are interested in becoming members should write to Howard A. Olson, Pres., c/o RADIO NEWS. These letters will be forwarded to him.

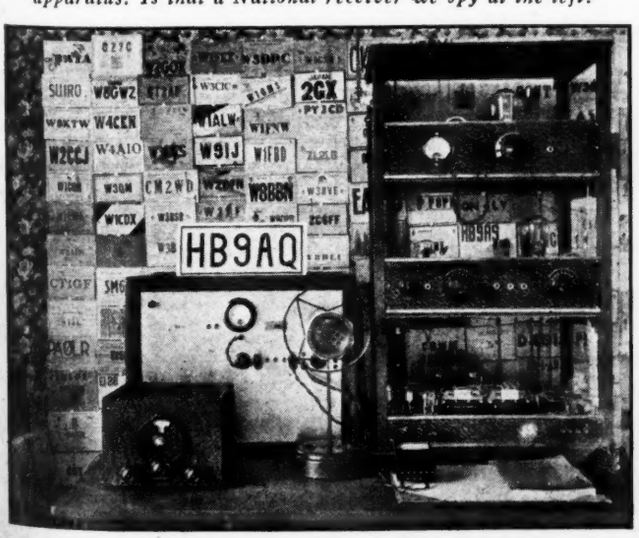
The Society of Wireless Pioneers

Many members of the Society of Wireless Pioneers have expressed the desire to

(*Turn to page* 121)

HAVE YOU HEARD THIS ONE?

Station HB9AQ is a 50-watt transmitter, located at Lausanne, Switzerland, and utilizing much American apparatus. Is that a National receiver we spy at the left?



HE SPECIALIZES IN "AUSSIES"

Another portrait of O.R.N.S.W.L.P.O. Amlie, shown seated in his DX Corner, before his "Amlie DX'er". Oliver is President of a new short-wave club

SHORT-WAVE STATION LIST

Arranged by Cities and Countries

EUROPE

AUSTRIA

Call	Location	Meters	kc.	Class
EATH	Vienna	37.01	8,100	P
OEJ	Vienna	39.28	7,632	P
OER	Vienna	29.89	10,033	P
OER2	Vienna	49.37	6,072	B
OER3	Vienna	25.41	11,801	B
OEV	Vienna	16.78	17,870	P
OEX	Vienna	23.19	12,931	P

AZORES

CT2AJ	San Miguel	74.92	4,002	A

BELGIUM

ORG	Ruysselede	15.61	19,200	B,P
ORK	Ruysselede	29.03	10,330	B,P
ORP	Ruysselede	22.71	13,200	B,P

CZECHOSLOVAKIA

OKI	Podebrady	14.27	21,020	P
OKI	Podebrady	58.27	5,145	B

DENMARK

OXY	Skamlebaek	19.60	15,300	E
OXY	Skamlebaek	31.49	9,495	B
OXY	Skamlebaek	49.48	6,060	B

FRANCE

FYB	Paris	28.32	10,578	T
FYA	Pontoise	19.67	15,243	B
FYA	Pontoise	25.22	11,891	B
FYA	Pontoise	25.57	11,725	B
———	Pontoise	19.40	15,454	P
FQO,FQE	Ste. Assise	24.69	12,150	P
FRO, FRE	Ste. Assise	16.43	18,240	P
FTA	Ste. Assise	25.12	11,950	P
FTD	Ste. Assise	15.12	19,830	P
FTF	Ste. Assise	38.59	7,770	P
FTI	Ste. Assise	30.47	9,840	P
FTK	Ste. Assise	18.88	15,880	P
FTN	Ste. Assise	24.46	12,260	P

GERMANY

DOA	Doeberitz	41.47	7,230	P
DOA	Doeberitz	67.68	4,430	P
DOA	Doeberitz	82.82	3,620	P
DFA	Nauen	15.58	19,240	P
DFB	Nauen	17.11	17,520	P
DFL	Nauen	27.63	10,850	P
DGU	Nauen	31.17	9,620	P
DHO	Nauen	14.97	20,028	P
DIH	Nauen	15.03	19,950	P
DIQ	Nauen	29.14	10,290	P
DWG	Nauen	14.88	20,140	P
DAF	Norddeich	17.37	17,260	P
DAF	Norddeich	23.51	12,745	P
DAF	Norddeich	36.00	8,470	P
DAN	Norddeich	18.00	16,665	E
DAN	Norddeich	26.44	11,340	T
DJA	Zeesen	31.36	9,560	B
DJB	Zeesen	19.72	15,200	B
DJC	Zeesen	49.80	6,020	B
DJD	Zeesen	25.48	11,770	B
DJE	Zeesen	16.88	17,760	B
DJL	Zeesen	19.85	15,100	B
DJM	Zeesen	49.37	6,073	E
DJN	Zeesen	31.43	9,540	B
DJO	Zeesen	25.42	11,795	E
DJP	Zeesen	25.31	11,855	E
DJQ	Zeesen	19.62	15,280	B
DJR	Zeesen	19.55	15,340	E
DFC	———	23.10	12,980	P
DDAC	S.S. Europa	23.00	13,040	P
DDAC	S.S. Europa	29.50	10,160	P
DDAC	S.S. Europa	36.00	8,328	P
DDAC	S.S. Europa	71.78	4,177	P
DDAS	S.S. Bremen	23.00	13,040	P
DDAS	S.S. Bremen	29.50	10,160	P
DDAS	S.S. Bremen	36.00	8,328	P
DDAS	S.S. Bremen	71.78	4,177	P
DDBR	S.S. Berlin	23.00	13,040	P
DDBR	S.S. Berlin	29.50	10,160	P
DDBR	S.S. Berlin	36.00	8,328	P
DDBR	S.S. Berlin	71.78	4,177	P
DDCB	S.S. Columbus	23.00	13,040	P
DDCB	S.S. Columbus	29.50	10,160	P
DDCB	S.S. Columbus	36.00	8,328	P
DDCB	S.S. Columbus	71.78	4,177	P
DDCG	S.S. Resolute	23.00	13,040	P
DDCG	S.S. Resolute	29.50	10,160	P
DDCG	S.S. Resolute	36.00	8,328	P
DDCG	S.S. Resolute	71.78	4,177	P
DDCP	S.S. Cap Polonio	23.00	13,040	P
DDCP	S.S. Cap Polonio	29.50	10,160	P
DDCP	S.S. Cap Polonio	36.00	8,328	P
DDCP	S.S. Cap Polonio	71.78	4,177	P
DDDT	S.S. Deutschland	23.00	13,040	P
DDDT	S.S. Deutschland	29.50	10,160	P
DDDT	S.S. Deutschland	36.00	8,328	P
DDDT	S.S. Deutschland	71.78	4,177	P
DDDX	S.S. Hamburg	23.00	13,040	P
DDDX	S.S. Hamburg	29.50	10,160	P
DDDX	S.S. Hamburg	36.00	8,328	P
DDDX	S.S. Hamburg	71.78	4,177	P
DDEA	S.S. Cap Arcona	23.00	13,040	P
DDEA	S.S. Cap Arcona	29.50	10,160	P
DDEA	S.S. Cap Arcona	36.00	8,328	P
DDEA	S.S. Cap Arcona	71.78	4,177	P
DDED	S.S. New York	23.00	13,040	P
DDED	S.S. New York	29.50	10,160	P
DDED	S.S. New York	36.00	8,328	P
DDED	S.S. New York	71.78	4,177	P
DDFF	S.S. Reliance	23.00	13,040	P
DDFF	S.S. Reliance	29.50	10,160	P
DDFF	S.S. Reliance	36.00	8,328	P
DDFF	S.S. Reliance	71.78	4,177	P
DDFT	S.S. Oceana	23.00	13,040	P
DDFT	S.S. Oceana	29.50	10,160	P
DDFT	S.S. Oceana	36.00	8,328	P
DDFT	S.S. Oceana	71.78	4,177	P
DDNY	S.S. Albert Ballin	23.00	13,040	P
DDNY	S.S. Albert Ballin	29.50	10,160	P
DDNY	S.S. Albert Ballin	36.00	8,328	P
DDNY	S.S. Albert Ballin	71.78	4,177	P

HUNGARY

HAS5	Szekesfehervar	17.50	17,122	B
HAS3	Szekesfehervar	19.51	15,370	B
HAT	Szekesfehervar	21.90	13,685	B
HAT4	Szekesfehervar	32.86	9,125	B
HAT2	Szekesfehervar	43.83	6,840	B
HAT	Szekesfehervar	55.52	5,400	B

ICELAND

TFK	Reykjavik	33.13	9,050	B

ABBREVIATIONS FOR CLASS COLUMN

A—Amateur
B—Broadcast
E—Experimental
P—Phone
T—Time Signals

ITALY

IAC	Coltano	16.89	17,750	P
IAC	Coltano	23.43	12,795	P
IAC	Coltano	35.78	8,380	P
IAC	Coltano	45.09	6,650	P
IAF	Fiumicino	10.06	29,817	E
IRS	Rome	30.10	9,960	P
IRM	Rome	30.53	9,820	P
I2RO	Rome	25.39	11,810	B
I2RO	Rome	31.07	9,650	B
I2RO	Rome	49.26	6,085	B
I2RO	Rome	79.95	3,750	B
IBEJ	S.S. Conte Rosso	70.00	4,283	P
IBEJ	S.S. Conte Rosso	35.00	8,566	P
ICEJ	S.S. Rex	70.00	4,283	P
ICEJ	S.S. Rex	35.00	8,566	P
IDLI	S.S. Conte di Savoia	70.00	4,283	P
IDLI	S.S. Conte di Savoia	35.00	8,566	P
IBDK	S.S. Elettra	26.14	11,470	E

MADEIRA

CT3AQ	Funchal	26.82	11,180	B
CT3AQ	Funchal	32.00	9,370	B

NETHERLANDS

PI1J	Dordrecht	42.34	7,082	A,B
PCJ	Eindhoven	19.70	15,220	E
PHI	Huizen	16.87	17,775	B
PHI	Huizen	25.56	11,730	B
PCK	Kootwijk	16.29	18,400	P
PCL	Kootwijk	18.39	16,300	P
PCM	Kootwijk	16.18	18,535	P
PCV	Kootwijk	16.84	17,800	P
PDK	Kootwijk	28.70	10,415	P
PDL	Kootwijk	38.79	7,730	P
PDM	Kootwijk	16.12	18,600	P
PDV	Kootwijk	24.87	12,060	P
PGA	Kootwijk	38.29	7,830	P

NORWAY

LGN	Bergen	31.23	9,600	P
LKJ1	Jeloy	31.43	9,540	E
LKJ1	Jeloy	42.89	6,990	B
LKJ1	Jeloy	48.91	6,130	B
LKJ1	Jeloy	60.94	4,920	E
LKJ1	Jeloy	73.13	4,100	E

PORTUGAL

CSL	Lisbon	48.75	6,150	B
CT1AA	Lisbon	19.55	15,340	B
CT1AA	Lisbon	31.23	9,600	B
CT1AA	Lisbon	50.14	5,980	B
CT1CT	Lisbon	24.82	12,082	B
CT1CT	Lisbon	79.95	3,750	B
CT1GO	Parede	24.19	12,396	B
CT1GO	Parede	48.38	6,198	B

POLAND

SRI	Poznan	31.33	9,570	B

ROUMANIA

YOI	Bucharest	21.52	13,940	B
YOI	Bucharest	49.97	6,000	B

SPAIN

EAJ25	Barcelona	49.97	6,000	B
EDN, EDX	Madrid	28.23	10,613	P
EHY	Madrid	14.37	20,860	P
EHY	Madrid	29.77	10,070	E
EAQ	Madrid	15.21	19,720	P
EAQ	Madrid	30.41	9,860	B
EAR110	Madrid	42.98	6,976	B
EAR125	Madrid	42.71	7,020	B

SWITZERLAND

HB9B	Basle	42.12	7,118	B
HB9B	Basle	79.53	3,770	B
EH90C	Berne	31.98	9,375	P
HBQ	Geneva	40.28	7,444	B
HBP	Geneva	38.49	7,790	B
HBL	Geneva	31.28	9,585	B
HBJ	Geneva	20.63	14,535	P
HBO	Prangins	24.93	12,030	P
HBQ	Prangins	44.91	6,675	E
HB9AQ	———	85.06	3,525	B

UNITED KINGDOM

GBK	Bodmin	16.56	18,100	P
GBK	Bodmin	26.10	11,490	P
GBK	Bodmin	32.41	9,250	P
GBJ	Bodmin	16.10	18,620	P
GSA	Daventry	49.56	6,050	B
GSB	Daventry	31.53	9,510	B
GSC	Daventry	31.30	9,580	B
GSD	Daventry	25.52	11,750	B
GSE	Daventry	25.28	11,860	B
GSF	Daventry	19.80	15,140	B
GSG	Daventry	16.85	17,790	B
GSH	Daventry	13.96	21,470	B
GSI	Daventry	19.65	15,260	B
GSJ	Daventry	13.93	21,530	B
GSL	Daventry	49.07	6,110	B
GAU	Rugby	16.10	18,620	P
GAW	Rugby	16.47	18,200	P
GBA	Rugby	14.71	20,380	P
GBC	Rugby	17.55	17,080	P
GBC	Rubgy	22.06	13,591	P
GBC	Rubgy	23.45	12,780	P
GBC	Rugby	34.54	8,680	P
GBC	Rugby	60.26	4,975	P
GBP	Rugby	27.84	10,770	P
GBQ	Rugby	22.29	13,450	P
GBS	Rugby	24.48	12,250	P
GBS	Rugby	24.69	12,150	P
GBU	Rugby	13.45	22,291	P
GBU	Rugby	24.40	12,290	P
GBW	Rugby	20.76	14,440	P
GBX	Rugby	18.56	16,150	P
GBX	Rugby	28.86	10,390	P
GCA	Rugby	30.88	9,710	P
GCB	Rugby	32.31	9,280	P
GCS	Rugby	33.24	9,020	P
GCU	Rugby	30.13	9,950	P
GCW	Rugby	30.63	9,790	P
GDS	Rugby	43.42	6,905	P
GDW	Rugby	62.20	4,820	P
G6RX	Rugby	60.33	4,970	E
G6RX	Rugby	69.44	4,320	E
GDLJ	S.S. Homeric	17.00	17,640	P
GDLJ	S.S. Homeric	22.66	13,230	P
GDLJ	S.S. Homeric	33.95	8,830	P
GDLJ	S.S. Homeric	71.78	4,177	P
GFWV	S.S. Majestic	17.00	17.640	P
GFWV	S.S. Majestic	22.66	13,230	P
GFWV	S.S. Majestic	33.95	8,830	P
GFWV	S.S. Majestic	71.78	4,177	P
GKFY	S.S. Minnetonka	17.00	17,640	P
GKFY	S.S. Minnetonka	22.66	13,230	P
GKFY	S.S. Minnetonka	33.95	8,830	P
GKFY	S.S. Minnetonka	71.78	4,177	P
GLSQ	S.S. Olympic	17.00	17,640	P
GLSQ	S.S. Olympic	22.66	13,230	P
GLSQ	S.S. Olympic	33.95	8,830	P
GLSQ	S.S. Olympic	71.78	4,177	P
GMBJ	S.S. Emp. of Britain	17.00	17,640	P
GMBJ	S.S. Emp. of Britain	22.66	13,230	P
GMBJ	S.S. Emp. of Britain	33.95	8,830	P
GMBJ	S.S. Emp. of Britain	71.78	4,177	P

U. S. S. R.

RCAD	Minsk	46.70	6,420	P
RKI	Moscow	19.93	15,040	P

RKI	Moscow	39.98	7,500	P
RW50	Moscow	36.70	8,170	B
RW59	Moscow	24.99	12,000	B
RW59	Moscow	49.97	6,000	B
REN, RW72	Moscow	45.35	6,611	B

VATICAN STATE

HVJ	Vatican City	19.83	15,123	B
HVJ	Vatican City	50.23	5,969	B

YUGOSLAVIA

—	Belgrade	29.98	10,000	B

NORTH AMERICA

CANADA

Call	Location	Meters	kc.	Class
VE9CA	Calgary, Alta	25.28	11,860	B
VE9CA	Calgary, Alta.	49.72	6,030	B
VE9CG	Calgary, Alta.	49.07	6,110	B
VE9CU	Calgary, Alta.	49.92	6,005	B
CSN	Rossland, B. C.	51.64	5,805	P
CFU	Rossland, B. C.	52.47	5,714	P
VE9CS	Vancouver, B. C.	49.39	6,070	B
CJRO	Winnipeg, Man.	48.67	6,160	B
CJRX	Winnipeg, Man.	25.59	11,720	B
VE9CL	Winnipeg, Man.	48.75	6,150	B
VE9AS	Fredericton, N. B.	46.67	6,425	B
VE9BJ	St. John, N. B.	49.23	6,090	B
VE9CF	Halifax, N. S.	49.15	6,100	B
VE9CF	Halifax, N. S.	49.56	6,050	B
VE9HK	Halifax, N. S.	48.99	6,120	B
VE9HX	Halifax, N. S.	25.34	11,835	B
VE9HX	Halifax, N. S.	49.07	6,110	B
VE9CX	Wolfville, N. S.	49.85	6,015	B
VE9GW	Bowmanville, Ont.	25.39	11,810	B
VE9GW	Bowmanville, Ont.	49.23	6,090	B
VE9BY	London, Ont.	17.33	17,300	E
VE9BY	London, Ont.	34.66	8,650	E
VE9BY	London, Ont.	46.67	6,425	B
VE9BY	London, Ont.	62.53	4,795	B
VE9EH	Charlottetown, P.E.I	49.31	6,080	B
CFA	Drummondville, Q.	43.83	6,840	P
CGA	Drummondville, Q.	21.79	13,740	P
CGA	Drummondville, Q.	22.47	13,340	P
CGA3	Drummondville, Q.	22.56	13,285	P
CGA5	Drummondville, Q.	30.26	9,905	E
CJA2	Drummondville, Q.	32.13	9,332	P
CJA4	Drummondville, Q.	24.78	12,100	E
CZA	Drummondville, Q.	62.60	4,785	P
VE9BA	Montreal, Que.	19.73	15,190	B
VE9BA	Montreal, Que.	48.91	6,130	B
VE9DN	Montreal, Que.	19.82	15,130	B
VE9DN	Montreal, Que.	25.45	11,780	B
VE9DN	Montreal, Que.	31.38	9,555	B
VE9DN	Montreal, Que.	49.93	6,005	B
VE9DR	Montreal, Que.	25.45	11,780	E
VE9DR	Montreal, Que.	31.30	9,580	E
VE9DR	Montreal, Que.	49.93	6,005	B
VTSX	S.S.Mon.of Bermuda	17.00	17.640	P
VTSX	S.S.Mon.of Bermuda	22.66	13,230	P
VTSX	S.S.Mon.of Bermuda	33.95	8,830	P
VTSX	S.S.Mon.of Bermuda	71.78	4,177	P

MEXICO

XAM	Merida, Yucatan	26.80	11,187	E
XAM	Merida, Yucatan	51.97	5,769	P
XEBT	Mexico, D. F.	49.89	6,010	B
XECR	Mexico, D. F.	40.63	7,380	B
XETE				
XEAL	Mexico, D. F.	31.23	9.600	B
XETE	Mexico, D. F.	48.91	6,130	B
XEW	Mexico, D. F.	49.78	6,023	B
XDA	Mexico, D. F.	20.50	14,630	P
XDA	Mexico, D. F.	25.50	11,760	E
XDA	Mexico, D. F.	31.98	9,375	P
XDA	Mexico, D. F.	51.16	5,860	P
XDC	Mexico, D. F.	31.90	9,400	E
XECW	Xantocam	50.14	5,980	B

UNITED STATES

KEB	Bolinas, Calif.	40.68	7,370	P
KEC	Bolinas, Calif.	58.71	5,105	P
KEE	Bolinas, Calif.	38.86	7,715	P
KEF	Bolinas. Calif.	44.68	6,710	P
KEI	Bolinas, Calif.	31.59	9,490	P
KEJ	Bolinas, Calif.	33.28	9,010	P
KEL	Bolinas, Calif.	43.71	6,860	P
KEM	Bolinas, Calif.	19.35	15,490	P
KEN	Bolinas, Calif.	43.80	6,845	P
KER	Bolinas, Calif.	28.86	10,390	P
KES	Bolinas, Calif.	28.80	10,410	P
KET	Bolinas, Calif.	31.63	9,480	P
KIKA	Bolinas, Calif.	58.79	5,100	P
KIKB	Bolinas, Calif.	58.67	5,110	P
KKL	Bolinas, Calif.	19.37	15,475	P
KKQ	Bolinas, Calif.	25.10	11,950	P
KKR	Bolinas, Calif.	19.39	15,460	P
KKW	Bolinas, Calif.	21.76	13,780	P
KKZ	Bolinas, Calif.	21.90	13,690	P
KMM	Bolinas, Calif.	14.43	20,780	P
KQG	Bolinas, Calif.	16.67	18,000	P
KQI	Bolinas, Calif.	16.64	18,020	P
KQR	Bolinas, Calif.	16.62	18,040	P
KQZ	Bolinas, Calif.	16.69	17,980	P
KSS	Bolinas, Calif.	14.40	20,820	P
KWE	Bolinas, Calif.	19.43	15,430	P
KEZ	Dixon, Calif.	28.83	10,400	P
KWN	Dixon, Calif.	14.24	21,060	P
KWO	Dixon, Calif.	19.45	15,410	P
KWU	Dixon, Calif.	19.53	15,355	P
KWV	Dixon, Calif.	27.66	10,840	P
KWX	Dixon, Calif.	39.40	7,610	P
KWY	Dixon, Calif.	39.63	7,565	P
W6XAJ	Oakland, Calif.	17.33	17,300	E
WNC	Hialeah, Florida	19.91	15,055	P
WND	Hialeah, Florida	73.13	4,100	P
W4XB	Miami Beach, Fla.	49.64	6,040	B
W9XAA	Chicago, Ill.	16.86	17,780	E
W9XAA	Chicago, Ill.	25.35	11,830	B
W9XAA	Chicago, Ill.	49.31	6,080	B
W9XF	Chicago, Ill.	25.24	11,880	B
W9XF	Chicago, Ill.	49.15	6,100	B
NSS	Annapolis, Md.	24.90	12,045	T
WWV	Beltsville, Md.	19.99	15,000	
(Standard	Frequency Transm.)	29.98	10,000	
		59.96	5,000	
W1XAL	Boston, Mass.	19.67	15,250	B
W1XAL	Boston, Mass.	25.43	11,790	B
W1XAL	Boston, Mass.	49.64	6,040	B
W1XK	Springfield, Mass.	31.33	9,570	B
W2XCU	Ampere, N. J.	17.34	17,300	E
W3XAL	Bound Brook, N. J.	16.86	17,780	B
W3XL	Bound Brook, N. J.	17.33	17,310	E
W3XL	Bound Brook, N. J.	46.67	6,425	E
W3XAL	Bound Brook, N. J.	49.15	6,100	B
WMI	Deal, N. J.	15.10	19,850	P
WMI	Deal, N. J.	30.91	9,700	P
WOO	Deal, N. J.	34.74	8,630	P
WOO	Deal, N. J.	46.02	6,515	P
W2XDJ	Deal, N. J.	14.00	21,420	E
WLO	Lawrence, N. J.	14.00	21,420	P
WCN	Lawrenceville, N. J.	59.05	5,077	P
WKA	Lawrenceville, N. J.	14.24	21,060	P
WKF	Lawrenceville, N. J.	15.60	19,220	P
WKK	Lawrenceville, N. J.	14.00	21.420	P
WKN	Lawrenceville, N. J.	15.13	19,820	P
WLA	Lawrenceville, N. J.	16.33	18,340	P
WLK	Lawrenceville, N. J.	18.43	16,270	P
WMA	Lawrenceville, N. J.	22.39	13,390	P
WMN	Lawrenceville, N. J.	20.55	14,590	P
WNA	Lawrenceville, N. J.	32.70	9,170	P
WNB	Lawrenceville, N. J.	28.09	10,675	P
WNB	Lawrenceville, N. J.	51.23	5,852	P
WOA	Lawrenceville, N. J.	44.38	6,755	P
WOF	Lawrenceville, N. J.	30.75	9,750	P
WOK	Lawrenceville, N. J.	28.42	10,550	P
WON	Lawrenceville, N. J.	30.38	9,870	P
WOY	Lawrenceville, N. J.	63.10	4,752	P
WOO	Ocean Gate, N. J.	17.51	17,110	P
WOO	Ocean Gate, N. J.	23.35	12,840	P
WOO	Ocean Gate, N. J.	35.03	8,560	P
WOO	Ocean Gate, N. J.	63.10	4,752	P
W2XDO	Ocean Gate, N. J.	34.74	8,630	E
W2XE	Wayne, N. J.	19.64	15,270	B
W2XE	Wayne, N. J.	25.35	11,830	B
W2XE	Wayne, N. J.	48.99	6,120	B
WAJ	Rocky Point, N. Y.	22.24	13,480	E
WCG	Rocky Point, N. Y.	28.88	10,380	P,E
WDS	Rocky Point, N. Y.	15.86	18,900	P
WEA	Rocky Point, N. Y.	28.25	10,610	E
WEC	Rocky Point, N. Y.	33.57	8,930	E
WED	Rocky Point, N. Y.	28.20	10,630	P
WEF	Rocky Point, N. Y.	31.59	9,490	P
WEG	Rocky Point, N. Y.	40.43	7.415	P
WEJ-W2XBJ	Rocky Point, N. Y.	44.48	6,740	E
WEL-W2XBJ	Rocky Point, N. Y.	33.50	8,950	E
WEM-W2XBJ	Rocky Point, N. Y.	40.52	7,400	P,E
WEN	Rocky Point, N. Y.	40.52	7,400	P
WER	Rocky Point, N. Y.	44.71	6,705	P
WES-W2XBJ	Rocky Point, N. Y.	31.73	9,450	E
WIK	Rocky Point, N. Y.	21.53	13,925	P
WIY	Rocky Point, N. Y.	21.62	13,870	E
WKJ	Rocky Point, N. Y.	31.26	9,590	P
WKU-W2XBJ	Rocky Point, N. Y.	20.22	14,830	E
WKW	Rocky Point, N. Y.	19.41	15,445	E
WQN	Rocky Point, N. Y.	57.00	5,260	E
WQO	Rocky Point, N. Y.	44.62	6,720	P
WQP	Rocky Point, N. Y.	21.57	13,900	P
W2XAC	Schenectady, N. Y.	34.50	8,690	E
W2XAD	Schenectady, N. Y.	19.56	15.330	B
W2XAF	Schenectady, N. Y.	31.46	9,530	B
W8XAL	Cincinnati, Ohio	49.48	6.060	B
W8XL	Dayton, Ohio	17.33	17.300	E
W3XAU	Philadelphia, Pa.	31.26	9,590	B
W3XAU	Philadelphia, Pa.	49.48	6,060	B
W8XK	Pittsburgh, Pa.	13.92	21,540	B
W8XK	Pittsburgh, Pa.	16.86	17,780	B
W8XK	Pittsburgh, Pa.	19.72	15,210	B
W8XK	Pittsburgh, Pa.	25.26	11,870	B
W8XK	Pittsburgh, Pa.	48.83	6,140	B
NAA	Arlington, Virginia	24.90	12,045	T
KNRA	Sch. Seth Parker	24.29	12,345	P
KNRA	Sch. Seth Parker	33.92	8,840	P
KNRA	Sch. Seth Parker	45.02	6,660	P
KNRA	Sch. Seth Parker	48.67	6,160	P

AFRICA

ALGERIA

Call	Location	Meters	kc.	Class
F8KR	Constantine	45.02	6,660	B

BELGIAN CONGO

OPL	Leopoldville	14.96	20,040	P
OPM	Leopoldville	29.57	10,140	P

BRITISH EAST AFRICA

VQ7LO	Nairobi, Kenya	31.18	9,616	B
VQ7LO	Nairobi, Kenya	49.48	6,060	B

CANARY ISLANDS

EA8AB	Tenerife	41.60	7,207	B

EGYPT

SUV	Cairo	24.74	12,120	P
SUV	Cairo	29.84	10,055	P
SUV	Cairo	31.33	9,570	B
SUX	Cairo	38.06	7,867	P
SUZ	Cairo	21.71	13,811	P

MADAGASCAR

—	Tananarive	49.97	6,000	B
FIQA	Tananarive	52.67	5,692	B

MOROCCO

CNR	Rabat	23.37	12,830	B
CNR	Rabat	32.24	9,300	B
CNR	Rabat	37.32	8,035	B

MOZAMBIQUE

CR7AA	Lourenzo Marques	84.63	3,543	B

PORTUGUESE WEST AFRICA

CR6AA	Lobita, Angola	41.78	7,177	B

RÉUNION ISLAND

—	St. Denis	49.97	6,000	B

UNION OF SOUTH AFRICA

ZTJ	Johannesburg	40.96	7,320	B
ZTJ	Johannesburg	49.17	6,098	B
ZSS	Klipheuvel	15.87	18,890	P

ASIA

CHINA

Call	Location	Meters	kc.	Class
XGOX	Nanking	16.84	17,800	B
XGOX	Nanking	25.20	11,900	B
XGOX	Nanking	31.56	9,500	B
XGOX	Nanking	49.97	6,000	B
XGBA	Shanghai	13.91	21,550	B
XGBB	Shanghai	16.85	17,790	P
XGBD	Shanghai	31.30	9,580	B
XGW	Shanghai	28.77	10,420	P
XQAJ	Shanghai	52.97	5,660	B
CQN	Macao (Portuguese)	49.37	6,073	B

INDIA

VUB	Bombay	31.34	9,565	B
VUC	Calcutta	25.26	11,870	B
VUC	Calcutta	49.07	6,110	B
VWY	Kirkee	17.11	17,510	P
VWY	Kirkee	33.40	8,975	P

IRAQ

YID	Bagdad	67.07	4,470	B

JAPAN

JYK	Kemikawa-cho	22.02	13,610	B
JYR	Kemikawa-cho	38.05	7,880	B
JYS	Kemikawa-cho	30.47	9,840	B
JYT	Kemikawa-cho	19.03	15,760	B,E
J1AA	Kemikawa-cho	17.23	17,400	P
JVC	Nazaki	15.74	19,050	P,B
JVE	Nazaki	19.15	15,660	P,B
JVF	Nazaki	19.20	15,620	P
JZG	Nazaki	47.36	6,330	P
JVH	Nazaki	20.54	14,600	P
JVM	Nazaki	27.92	10,740	P,B
JVN	Nazaki	28.12	10,660	B
JVP	Tokio	39.92	7,510	P
JVQ	Nazaki	40.14	7,470	P
JVT	Nazaki	44.42	6,750	P,B
JES	Osaki	19.20	15,620	P,B
M2A	Penhishu, Manchuria	42.23	7,100	E,B
JIC	Taihoku, Formosa	50.90	5,890	P

FEDERATED MALAY STATES

ZGE	Kuala Lumpur	48.90	6,132	B
ZHI	Singapore	49.87	6,012	B
ZHJ	Penang, Straits Settlements	49.31	6,080	B

FRENCH INDO-CHINA

FZS2	Saigon	25.01	11,991	P
FZS3	Saigon	16.34	18,345	P
FZR3	Saigon	18.49	16,214	P

NETHERLANDS EAST INDIES

PNI	Makassar, Celebes	34.17	8,775	P,B
—	Batavia, Java	69.24	4,330	B
PKYDA2	Bandoeng, Java	48.99	6,120	B

WEST INDIES

BAHAMA ISLANDS

Call	Location	Meters	kc.	Class
ZFS	Nassau	66.45	4,512	P

BERMUDA

ZFA	Bermuda	59.67	5,025	P
ZFD	Hamilton	29.01	10.335	E
ZFB	St. George	29.84	10,053	P

CUBA

CMCI	Havana	49.48	6,060	B
COC	Havana	49.89	6,010	B
COH	Havana	31.80	9,428	B
CMHB	Sanctus Spiritus	29.39	10,200	B
CO9GC	Santiago	48.75	6,150	B

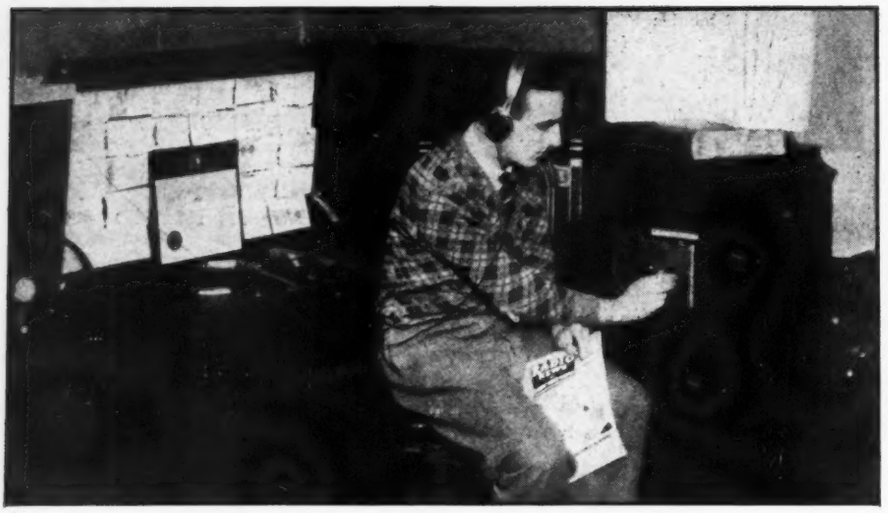
DOMINICAN REPUBLIC

HI3C	La Romana	43.45	6,900	B
HIX	Santo Domingo	50.14	5,980	B
HIZ	Santo Domingo	47.48	6,315	B
HI4D	Santo Domingo	46.25	6,482	B
HIH	San Pedro de Macoris	44.00	6,814	B
HI1A	Santiago de los Caballeros	47.80	6,272	B
HI1A	Santiago de los Caballeros	48.45	6,188	B

VIRGIN ISLANDS

WTDW	St. Croix	69.81	4,295	E
WTDX	St. John	69.81	4,295	E
WTDV	St. Thomas	69.81	4,295	E

NEXT MONTH:
Central and South America, Oceania



O. R. N. L. P. O. FOR ENGLAND

R. T. Coales is shown tuning a short-wave converter. Behind him is his broadcast receiver console—an H. M. V. 9-tube super. As proof of his versatility, Observer Coales placed 4th in the IDA World-Wide DX Contest in 1934, then 2nd in the short-wave contest of the British IDA.

THE DX CORNER

(For Broadcast Waves)

S. GORDON TAYLOR

SOME months ago it was announced in this department that special attention was being given to the development of equipment especially suited for DX work and that as these developments were completed constructional articles would appear in RADIO NEWS. The first of these, the "RADIO NEWS Trap-Circuit Tenatuner," a universal antenna tuning unit which has given surprising results, was described in detail last month. This month, the first of two articles on a battery-operated DX superheterodyne appears. This little battery-operated receiver is inexpensive and is not difficult to build, yet in operating tests it has shown some rather amazing qualities, especially its sensitivity, low noise level, and selectivity.

Work on a broadcast-band converter is proceeding rapidly with every effort being made to have it completed in time for the next issue. This converter is intended to be connected ahead of t.r.f. or superheterodyne receivers. Its four tuned circuits (gang tuned) will provide greatly increased selectivity and it is expected to provide signal voltage gain in excess of 200. This unit will be entirely line operated and will be simple to construct and install.

The tuning and signal strength meter system described in connection with the battery-operated super in this issue is something distinctly worthy of the consideration of every DX'er who employs a superheterodyne receiver (providing the receiver has automatic volume control). If your superheterodyne already has a tuning meter, this improved meter with its shunt resistor can be connected in series with the present meter. If your receiver does not have a tuning meter, the new meter and shunt may be connected in the B+ lead to one or more of the tubes controlled by the a.v.c. system.

DX Club Register

Below is given a list of the DX Clubs which, up to the time of present writing, have been brought to the attention of this department. More detailed information concerning any of these clubs—their scope, purpose, activities, dues, etc.—may be obtained by addressing the clubs direct. Better still, just drop a postcard to the editor of this department stating the club or clubs in which you are interested and we will see that detailed information reaches you promptly.

In the following list the amount of dues is given, where known. In the majority of other cases, where dues are charged, they vary from $1.00 to $1.50 per year.

Canadian DX Relay, Goderich, Ontario, Canada, Fred H. Bisset, Pres.

Globe Circlers DX Club, 254 Cleveland St., Brooklyn, New York; William H. Wheatley, Pres.; Observer Raphael Geller, Secretary-Treasurer; world-wide membership, dues $1.25 per year, issues a 6-page bulletin twice monthly.

International DX'ers Alliance, Bloomington, Ill.; Charles A. Morrison, Pres.; world-wide membership, dues $1.00 per year, issues a 16-page bulletin monthly.

KDKA DX Club, c/o Station KDKA, Pittsburgh, Pa.; Joseph Stokes, Pres.; no membership dues, broadcasts DX tips weekly over KDKA and W8XK.

National Radio Club, 603 W. Market St., York, Pa.; Robert H. Weaver, Pres.; dues $1.25 per year, bulletins weekly throughout the winter and monthly during the summer.

Newark News Radio Club, 215 Market St., Newark, N. J.; Irving R. Potts, Pres.; world-wide membership, news and DX tips published regularly in the Newark Evening News.

United States Radio DX Club, Shrewsbury, Mass.; George D. Deering, Jr., Pres.

Universal Radio DX Club, San Francisco, Calif.; Charles Norton, Pres.

In most instances, the editor of this department will be able to provide samples of the bulletins of the clubs in which readers may be interested.

Executives of clubs not listed above are invited to forward information covering their organizations.

RADIO NEWS DX Specials

WCAU, 1170 kc., 50 kw., and the short-wave station W3XAU, 6060 kc., 1 kw., will go on the air at 2 a.m., E.D.S.T. (1 a.m., E.S.T.), July 2nd, with a special DX program dedicated to the DX Corners of RADIO NEWS. This dual broadcast was arranged by Official Listening Post Observer Bob Cleaver, who will be at the microphone during this broadcast. Unfortunately RADIO NEWS will reach many readers too late to enable them to listen in on this broadcast, but it is hoped that those who do read this notice in time will report to these stations.

WPEN, 920 kc., 250 w., Philadelphia, Pa., is dedicating a special DX program to the Broadcast Band DX Corner of RADIO NEWS on July 10th, at 2-2:30 a.m., E.D.S.T. This broadcast was also arranged by Observer Bob Cleaver and it is hoped that it will be widely heard and reported by DX'ers.

Periodic DX Broadcasts

The great majority of stations that have been broadcasting DX Tips on regular schedules have discontinued these broadcasts for the summer. Full information has not been received concerning all of them. It does appear definite, however, that KFI is continuing its broadcasts on Saturday at 2:30 a.m. KDKA is also on the air on Saturday mornings, 12-12:30 a.m., but at this writing it is not certain whether this is E.S.T. or E.D.S.T. Readers are advised to try at both times. Another station definitely broadcasting tips is W9XBY, 1530 kc., 1 kw., Kansas City, Missouri. The broadcasts begin at 1:01 E.S.T., Wednesdays.

Official RADIO NEWS Broadcast Band Listening Post Observers

United States

Alabama: Ray Wood
California: Roy Covert, Bill Ellis, Randolph Hunt, Warren E. Winkley
Connecticut: Fred Burleigh, James A. Dunigan, Philip R. Nichols, R. L. Pelkey
Georgia: W. T. Roberts
Illinois: Herbert H. Diedrich, Ray E. Everly, H. E. Rebensdorf, D. Floyd Smith
Indiana: E. R. Roberts
Iowa: Lee F. Blodgett, Ernest Byers
Kansas: Vernon Rimer
Maine: Danford Adams, Steadman O. Fountain, Floyd L. Hammond
Maryland: Louis J. McVey, William L. Bauer, William Rank, Henry Wilkinson, Jr.
Massachusetts: William W. Beal, Jr., Walter C. Birch, Russell Foss, Simon Geller, Robert A. Hallett, Evan B. Roberts
Michigan: John DeMyer, Howard W. Eck
Minnesota: F. L. Biss, Walter F. Johnson
Missouri: Dudley Atkins, III.; C. H. Long
Montana: R. W. Schofield
New Jersey: Henry A. Dare, Jack B. Schneider, Alan B. Walker
New York: Jacob Altner, Stephen Flynn, Ray Geller, Edward F. Goss, Robert Hough, Robert Humphrey, John C. Kalmbach, Jr., Harry E. Kentzel, Maynard J. Lonis, Harold Mendler, R. H. Tomlinson
North Carolina: Marvin D. Dixon
North Dakota: O. Ingmar Oleson
Ohio: Stan Elcheshen, Donald W. Shields, Richard J. Southward
Oregon: David Hunter, Walter Weber
Pennsylvania: Robert W. Botzum, Robert Hoffman Cleaver, Edward Kocsan, J. Warren Routzahn, Joseph Stokes
Tennessee: W. S. Jackson
Texas: E. L. Kimmons
Virginia: C. C. Wilson
Washington: John Marshall Junior High School Radio Club
West Virginia: Clifford Drain
Wyoming: J. H. Woodhead

Foreign

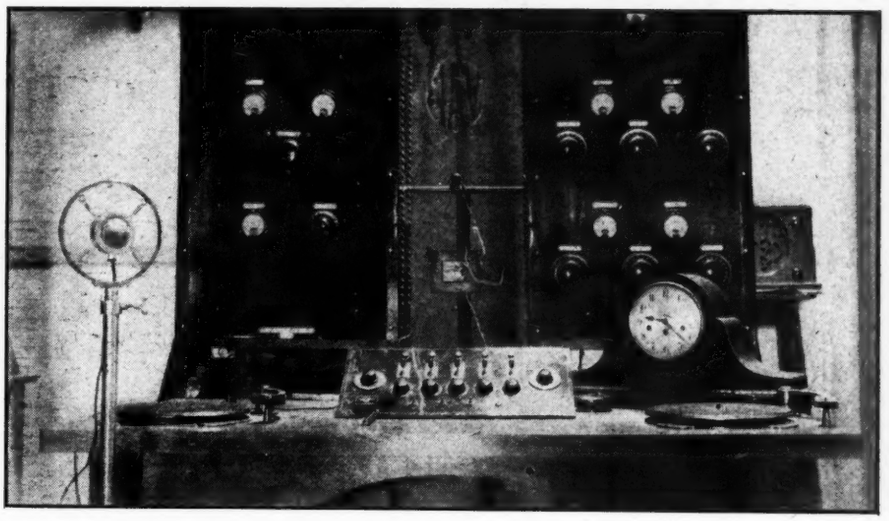
Alaska: S. A. Tucker
Australia: Albert E. Faull, Victoria; George F. Ingle, New South Wales; Aubrey R. Jurd, Queensland.
Canada: William H. Ansell, Saskatchewan; C. R. Caraven, British Columbia; Claude A. Dulmage, Manitoba; C. Holmes, British Columbia; Philip H. Robinson, Nova Scotia; Art Ling, Ontario
England: R. T. Coales, Hants; F. R. Crowder, Yorkshire; George Ellis, North Stockport; Charles E. Pellatt, London
Irish Free State: Ron. C. Bradley
Newfoundland: A. L. Hynes, Clarenville
New Zealand: P. T. Kite, Auckland; L. W. Mathie, Hawke's Bay; R. H. Shepherd, Christchurch; Eric W. Watson, Christchurch
Philippine Islands: George Illenberger
Puerto Rico: Ralph Justo Prats, Santurce
South Africa: A. C. Lyell, Johannesburg
Sweden: John S. Bohm, Malung
Switzerland: Dr. Max Hausdorff, Viganello

Postal Rates

Observer Hunter (Oregon) gives the following list of countries to which letters of 1 ounce

THE TRANSMITTER AT 4AY
(980 kc.)

To Observer Ansell, Saskatchewan, goes the credit for being the first American to hear the Australian station which at the time was using only 30 watts power according to verification received from Norman L. Dahl, Managing Director of the station. At the rear are the modulator and r.f. panels and on the table are the control panel and turntables.



or less may be sent for 3 cents. He states that postcards to these countries require 2 cents postage and must not exceed a size of 6 inches by 4½ inches nor be smaller than 4 inches by 2¾ inches:

Andorra, Argentina, Balearic Isles, Bolivia, Brazil, Canada, Canary Isles, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Guatemala, Haiti, Honduras (Rep. of), Mexico, Newfoundland (inc. Labrador), Nicaragua, Panama, Paraguay, Peru, El Salvador, Spain and Possessions, Uruguay, Venezuela

F.C.C. Monitor Schedules

The complete schedule of monitor transmissions was given in this department in the March issue. Following are the changes which bring that schedule up to date as of May 22, as supplied from Washington.

Add

Monday: 2:40 a.m., 1310 kc., WMFF, Plattsburgh, N. Y.; 3:40 a.m., 1420 kc., WLEU, Erie, Pa.; 4:00 a.m., 1310 kc., WHAT, Phila., Pa.; 7:40 a.m., KRLC, Lewisten, Idaho.
Wednesday: 3:00 a.m., 1210 kc., KIUL, Garden City, Kans.; 5:40 a.m., 1370 kc., KFRO, Longview, Texas.
Thursday: 2:20 a.m., 1370 kc., WMFD, Wilmington, N. Car.; 3:30 a.m., 550 kc., WKRC, Cincinnati, Ohio; 4:20 a.m., 1420 kc., KABR, Aberdeen, S. Dak.; 4:40 a.m., 1310 kc., KIUJ, Santa Fe, N. Mex.; 4:50 a.m., 1370 kc., KFGQ, Boone, Iowa; 5:10 a.m., 1370 kc., WPAY, Portsmouth, Ohio; 5:20 a.m., 1500 kc., KPLC, Lake Charles, La.; 5:30 a.m., 1200 kc., WAIM, Anderson, N. C.; 5:40 a.m., 1420 kc., WMFJ, Daytona Beach, Fla.
Friday: 5:00 a.m., 1430 kc., KSO, Des Moines, Iowa.
Saturday: 3:10 a.m., 550 kc., WDEV, Waterbury, Va.; 5:10 a.m., 1210 kc., KGCR, Watertown, S. Dak.

Delete

Monday: 2:50 a.m., 1310 kc., WHAT, Phila., Pa.; 4:30 a.m., 1200 kc., WNBO, Silverhaven, Pa.
Tuesday: 5:00 a.m., 1420 kc., KGIX, Las Vegas, Nevada, United States of America.
Thursday: 5:10 a.m., 1370 kc., WHBD, Mt. Orab, Ohio.
Friday: 5:00 a.m., 1430 kc., KWCR, Cedar Rapids, Iowa.
Saturday: 5:10 a.m., 12:10 kc., KWCN, Watertown, S. Dak.

Changes

Monday: 2:50 a.m., 1420 kc., WHDL, Olean, N. Y., changed location from Tupper Lake, N. Y.; 4:20, 1260 kc., KGVO, Missoula, Mont., frequently changed from 1200 kc.
Tuesday: 2:00 a.m., 1210 kc., WPAX, Thomasville, Ga., call changed from WQDX; 3:00 a.m., 1370 kc., WMBR, Jacksonville, Fla., location changed from Tampa, Fla.
Wednesday: 2:50 a.m., 880 kc., WPHR, Petersburg, Va., frequency changed from 1200 kc.; 3:10 a.m., 1420 kc., KGIW, Alamosa, Colo., location changed from Trinidad, Colo.; 5:30 a.m., 900 kc., WTAD, Quincy, Ill., frequency changed from 1440 kc.
Thursday: 4:30 a.m., 1500 kc., WKBZ, Muskegon, Mich., location changed from Ludington, Mich.; 4:40 a.m., 1420 kc., WCBS, Springfield, Ill., frequency changed from 1210 kc.
Friday: 3:30 a.m., 1200 kc., KGEK, Sterling, Colo.; location changed from Yuma, Colo.
Saturday: 3:00 a.m., 1200 kc., WJBC, Bloomington, Ill., location changed from LaSalle.

DX Antennas

"Now that DX is practically at a standstill on the BCB, I think it would be a good idea for the listening post observers to report their success with different aerials or grounds. In my case this past season, I had 6 aerials, 2 of the grounded type. They were—1 extending NW, 160 ft. long, 20 ft. high, grounded; 1 extending SW, 100 ft. long, 15 ft. high (only used a short time); 1 300 ft. long, 30 ft. high, grounded, extending NW; 1 320 ft. long, 20 ft. high, extending NE; 1 600 ft. long, 30 ft. high, extending NW. For a ground I had a car radiator buried 4 ft. deep. I operated my receiver upstairs. . . . 1 more aerial, a T type—180 ft. long, 40 ft. high, north and south (all others were of the L type). This T aerial wire was No. 12 solid, enamel; all the rest were No. 14 solid, enamel, except the one extending NE, which was 7 strand No. 22, enameled. I had best results using the 320-ft. stranded wire extending NE as an aerial and using the aerial that extended NW 160 ft. (and grounded at the far end) for a ground. As I had my aerials all connected to double throw switches, I could connect any of them to either the ground post or the aerial post very quickly and easily. Many times I found that interference could be reduced considerably by using different combinations. My 600-ft. aerial was a big disappointment to me. I erected it with the hopes of hearing Alaska, but I never did. There was a row of willow trees extending crossways at the far end of this aerial and I now think they grounded the signal to a great extent."—**Observer Rebensdorf.**

Our Readers Report—

H. A. McKnight (Idaho) encloses an interesting little folder received by him from W9XBY,

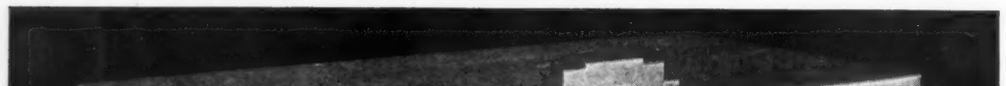
(*Turn to page* 122)

U. S. Station Changes

The following changes have been announced by the Federal Communications Commission. Abbreviations employed are: Cp—construction permit; Unltd.—unlimited; Auth.—authority or authorization; Spec.—special; Mod.—modification; Temp.—temporary; L. S.—local sunset; Lic.—license.

1200	WAIM	Ironwood, Mich. Granted license to cover new station to operate on 1200 kc., 100 w. Unltd. time.
1500	KGKY	Scottsbluff, Neb. Granted license to cover increase in power: 100 w., night, 250 kw., day. Unltd. time.
1400	KTUL	Tulsa, Okla. Granted change in power from 500 w., night and day to 500 w., night, 1 kw., day. Unltd. time.
780	WEAN	Providence, R. I. Granted increased power from 250 watts night, 500 w. day, to 500 watts day and night.
1200	WMFR	High Point, N. C. Granted CP for new station to operate on 1200 kc., 100 w., day. Daytime hours.
1320	KSO	Cedar Rapids, Iowa. Granted spec. auth. to operate with power of 250 watts, day and night, at Des Moines, Iowa, to Nov. 1, 1935.
850	WESG	Elmira, N. Y. Directed to change frequency from 850 kc., and granted spec. auth. to operate on 1000 kc. until August 1, 1935.
1130	WJJD	Chicago, Ill. Granted spec. auth. to begin operation at 5 a.m., C.S.T. until Aug. 1, 1935.
780	KTM	Los Angeles, Calif. Call changed to KEHE.
560	KTAB	San Francisco, Calif. Call changed to KSFO.
1200	WKBO	Harrisburg, Pa. Granted license increasing power to 100 w. night, 250 w. day.
1500	WKBZ	Muskegon, Mich. Granted license to increase day power to 250 watts day, 100 w. night. Unltd. time.
1320	KRNT	Des Moines, Iowa. Granted extension of spec. auth. to operate with 500 watts night, 1 kw., day, to Nov. 1, 1935.
1310	WLNH	Laconia, N. H. Granted an increase in hours of operation from day time to unltd.
1210	WPAX	Thomasville, Georgia. Granted CP to increase day power to 250 watts.
900	WJAX	Jacksonville, Fla. Granted CP to increase day power to 5 kw.
1320	WORK	York, Pa. Granted Mod. of Lic. to operate with 1 kw. night, using directional antenna. Unltd. time.
1420	WMFJ	Daytona Beach, Fla. Granted lic. to cover new station to operate on 1420 kc., 100 watts. Unltd. time.
1440	KXYZ	Houston, Tex. Granted license authorizing increase in power from 500 w. to 1 kw. Unltd. time.
1370	WMFD	Wilmington, N. C. Granted license covering new station to operate on 1370 kc., 100 w. Daytime only.
950	KHSL	Chico, Calif. Granted license covering new station to operate on 950 kc., 250 w. Daytime only.
1500	KPLC	Lake Charles, La. Granted license covering new station to operate on 1500 kc., 100 w. Unltd. time.
630	WPRO	Providence, R. I. Granted spec. auth. to change frequency from 1210 kc. to 630 kc., 250 w. Unltd. time.
1440	WSAN	Allentown, Pa. Granted Mod. of license covering increase in power from 250 to 500 watts.
780	WMC	Memphis, Tenn. Granted Mod. of license to increase night power to 1 kw., directional antenna; 2.5 kw. day, conventional antenna.
1500	WKBB	E. Dubuque, Ill. Granted license to cover increase in day power to 250 watts, and hours of operation to Unltd. 100 w. night.
1420	WNRA	Muscle Shoals City, Ala. Granted Mod. of Lic. to change time of operation from daytime to Unltd., 100 watts.
1370	KIUP	Durango, Colo. Granted Auth. to erect a new station, 1370 kc., 100 w. Unltd. time.
1310	WROL	Knoxville, Tenn. Granted application to increase day power from 100 to 250 watts.
1310	WBOW	Terre Haute, Ind. Reaffirmed auth. to increase power to 250 watts.
700	WLW	Cincinnati, Ohio. Granted permission to operate from sunset to midnight with 500 kw.
1310	KINY	Juneau, Alaska. Granted amended CP to change frequency from 610 to 1310 kc., and power from 250 watts to 100 watts, night and day.
1120	WTAW	College Station, Tex. Granted special auth. to remain silent to Sept. 1.
1220	KWSC	Pullman, Wash. Granted spec. auth. to operate from 6 to 10 p.m., daily, except Sun., and holidays, and from 6 to 7:30 p.m., P.S.T., on Thursdays, for the period beginning June 1 and ending not later than Sept. 30, 1935.
600	WCAC	Storrs, Conn. Granted spec. auth. to remain silent June 10 to Sept. 1, 1935.
600	WICC	Bridgeport, Conn. Granted spec. auth. to operate unltd. time provided WCAC remains silent) June 10 to July 9, 1935.
760	WEW	St. Louis, Mo. Granted spec. auth. to discontinue operation, with exception of the broadcasting of all Govt. reports, June 15 to Aug. 1, 1935.
560	KWTO	Springfield, Mo. CP to increase power from 1 to 5 kw., for daytime use.
1020	WDZ	Tuscola, Ill. Granted amended CP to change frequency from 1070 to 1020 kc., power from 100 watts to 250 watts daytime.
1300	KFH	Wichita, Kans. Granted CP to increase power to 5 kw., day.
1410	WHIS	Bluefield, W. Va. Granted license, 1410 kc., 250 w., night, 500 w. day.
1120	WGCM	Mississippi City, Miss. Granted amended CP to change frequency to 1120 kc., increase power to 500 watts; hours unltd. except from 8 to 9 p.m. Mon. and Fri.
940	WDAY	Fargo, N. Dak. Granted license, 1 kw., night; 5 kw. day. Unltd. time.
1430	KSO	Des Moines, Ia. Granted license, 250 w. night, 500 w. day. Unltd.
1320	KRNT	Des Moines, Ia. Granted license, 500 w. night, 1 kw. day.
1210	KWEA	Shreveport, La. Granted spec. auth. to remain silent June 1 to July 31, 1935.
1200	WCAT	Rapid City, S. Dak. Granted spec. auth. to remain silent June 1 to Sept. 9, 1935.
1200	.....	Newport, R. I. Granted CP for new station to operate on 1200 kc., 100 watts night, 250 watts day. Unltd. time.
1210	.....	Del Monte, Calif. Granted CP for new station to operate on 1210 kc., 100 w. Unltd. time.

A WEALTH of Born



By
B. Gordon Valentine

Part Two

THE receiver described in this series offers a number of novelties and is presented primarily for the experienced set builder and for those who will be able to apply such features of this receiver as particularly appeal to him.

A GENERAL description of the V-8 tuner was given in the July edition of RADIO NEWS. To deal with the circuit in greater detail, let us follow the schematic diagram from input to output. It will be noticed that two antenna primary connections are provided—one consisting of a 300-turn choke to ground and a 35-mmfd. variable condenser from the high end of this choke to the grid of the first r.f. tube. Variation of the coupling condenser permits of the input circuit being matched to any antenna, and the choke condenser combination provide a means of levelling the over-all sensitivity of the tuner. The other connection affords a low-impedance primary, which in general is better suited to operation with antenna tuning devices (such as the RADIO NEWS "Tenatuner" described elsewhere in this issue) and used to advantage by many to build up signal strength. Both ends of this winding are free, therefore the ground connection can be independent of the chassis—sometimes an advantage. All r.f. transformers are single-layer solenoids on 1-inch diameter bakelite forms, with primaries wound over the low end of the secondaries, about 3/32 inch separation being provided by a band of empire cloth. R.F. coils are enclosed in copper shields, and the oscillator coil is left unshielded. The size of the primaries is based on a compromise between gain and selectivity at signal frequencies, and could be varied to suit local conditions. Filtration is applied to grid return, plate, screen and cathode circuits. In the grid return we have the 100,000 ohms resistor and .05 mfd. bypass capacity. The plate circuit has a choke-capacity filter and this applies also to the cathode. Here the value of 1 mfd. used as bypass is larger than commonly used in this position—and is effective in achieving stability. A bias resistor of 250 ohms is used, and additional bias is applied to the grid from the a.v.c. source. The value of resistor to use for bias is dependent on obtaining stability under conditions of "No a.v.c." operation and a departure from the value stated should be made to attain this. A resistance-capacity filter is employed in the screen grid supply. Note that all plate and screen bypassing is done directly to the cathode of the tube and not to the chassis. The circuit around the second r.f. stage is similar to that described for the first stage with the exception that a rheostat is included in the cathode circuit to allow of regulating r.f. gain. This position was chosen, as it was found that when regulation was applied to the first r.f. stage a less favorable signal to noise ratio existed. Here, too, a.v.c. is applied. The grid return of the 57 modulator is filtered in the same way as in the preceding stages, but goes to ground instead of to the source of a.v.c. voltage.

SELECTIVITY—FIDELITY CONTROL

Details of the mechanical arrangement for varying the coupling of the i.f. transformer

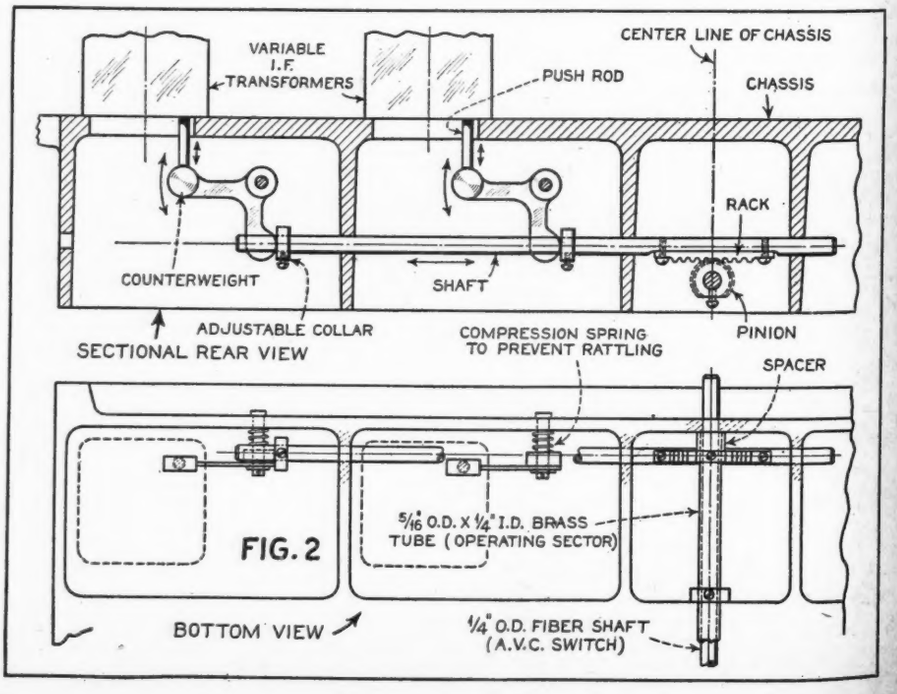


FIG. 2

Ideas! of a Hobby

(THE VALENTINE "SUPERHET")

Features of this Unusual Set

1. **ULTRA HIGH GAIN**
2. **VARIABLE SELECTIVITY,** *providing hair-splitting station separation at one extreme and full-tone reproduction at the other*
3. **AUTOMATIC VOLUME CONTROL,** *plus manual gain controls*
4. **AUXILIARY CONTROLS,** *permitting precise regulation of all circuits*
5. **UNUSUALLY COMPLETE SHIELDING,** *for utmost stability*

In this connection attention is drawn to the fact that "ground" does not imply the chassis. All grounding is done to a heavy tinned copper bus insulated from the chassis by varnished cambric tubing at all points where it passes through the partitions, and the chassis is connected to this bus at one point only, and that as near to the five-pin connection plug as possible. Furthermore, all tuned circuits are completed independent of the chassis, and independent of each other, by insulating the tuning condensers from the chassis and from each other. In this way eddy currents in the chassis itself are prevented —or at least limited.

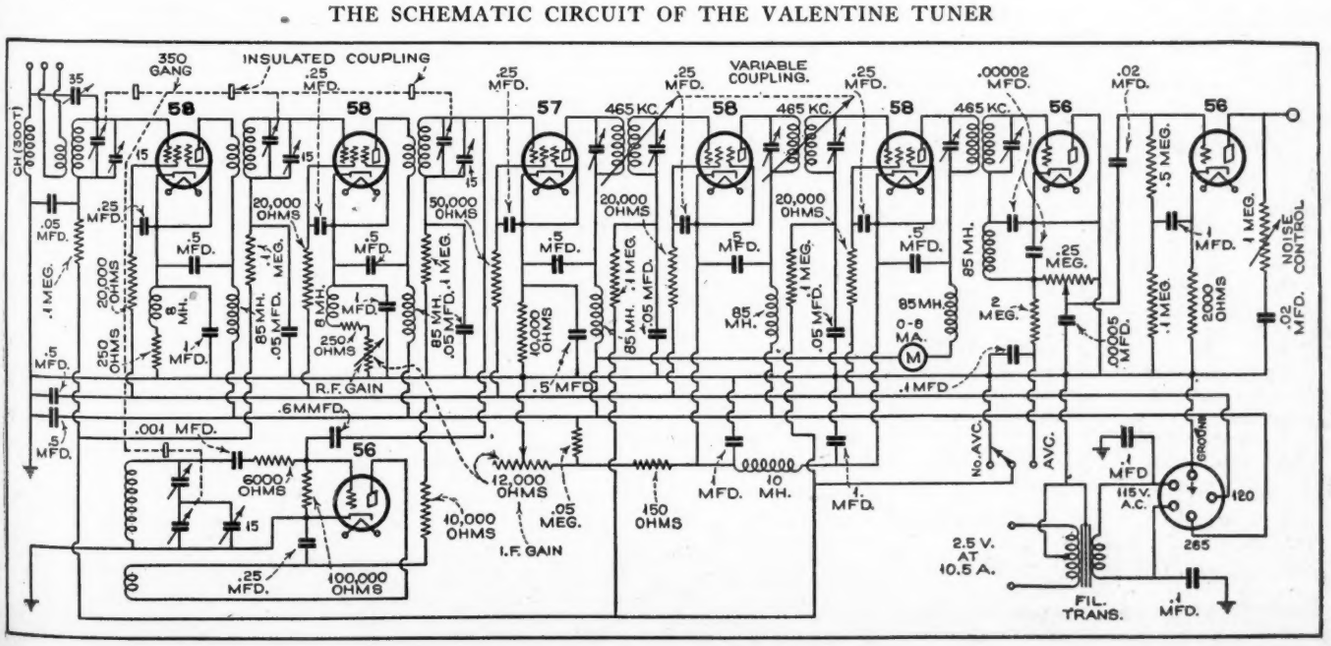
Lead in Metal Groove

As was mentioned in the first article, the lead from the 3rd r.f. transformer to plate of 2nd r.f. tube is run in a separate milled groove along the top of the chassis. This lead is of necessity fairly long, and being at high r.f. potential care is taken to obtain as large a separation as possible between it and the metal of the chassis by using wire with thick insulation. A 10,000-ohm resistor biases the modulator.

Coming now to the oscillator, we find a resistance-capacity filter in the plate supply lead. This serves the double purpose of isolation and improvement in stability, which latter factor, although of less importance in the oscillator of a broadcast tuner than that in one designed for short-wave reception, is nevertheless desirable. The .001 mfd. condenser and 6000-ohm resistor in the grid circuit tend to regulate amplitude of oscillation. A grid leak of value of 100,000 ohms is indicated, but here again the value is dictated by the degree of modulation of the 57 found to be desirable and lower values may be used as required. The padding condenser is placed in the "high" position, which appears to afford higher sensitivity than when connected between the low end of the oscillator tuning condenser and ground. The latter position allows of easier adjustment, however. Coupling of the oscillator to the modulator is effected by a very small capacity of .6 mmfd. from grid to grid.

A 15-mmfd. trimming condenser is connected in parallel with each of the main condensers tuning the radio-frequency and oscillator circuits, and as was mentioned in the general description these may be manually controlled. Care was taken when making the coils to match the r.f. inductances as closely as possible. In operation the tuner can be operated "single-dial control" without having recourse to the trimmers at all after they have been set to give the correct minimum capacity in each circuit. By reducing the capacity of the oscillator trimmer, however, it is possible to receive signals up to a frequency of 1720 kc. and it can always be reset to give the 540 to 1650 kc. coverage provided by operation of the main dial only. As regards choice of intermediate frequency to employ, experience with fixed coupled i.f. transformers tended to show that more (*Turn to page* 127)

THE SCHEMATIC CIRCUIT OF THE VALENTINE TUNER



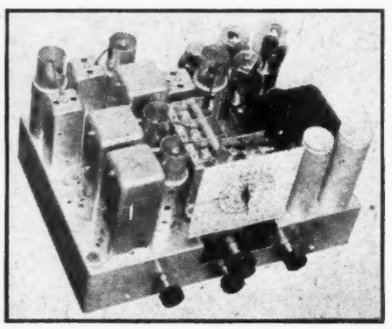
WHAT'S NEW IN RADIO

WILLIAM C. DORF

(*Continued from page 73*)

15 to 2100 Meters

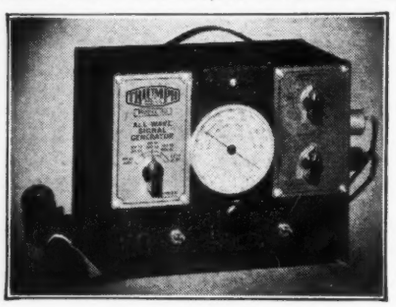
Outstanding in the new line of Hetro receivers, is the Air-Ace 9-tube superheterodyne covering a wavelength range from 15 to 2100 meters. It is equipped with a continuous band-spread micrometic airplane type two color dial, calibrated in



meters, kilocycles and megacycles. There are nine tuned circuits on each band and the manufacturer claims better than 10 kc. selectivity.

Signal Generator with Direct Reading Dial

The new Triumph model 110 all-wave signal generator is equipped with a "T" pad output attenuator, with the output variable from 0 to 500,000 microvolts. The



frequency range is from 100 kc. to 30 megacycles, and is calibrated on a vernier airplane type dial in two colors. The common test frequencies are spotted on the dial.

A Tuning Coupler for Doublet Antenna

A new all-wave tuning coupler for use with twisted wire transmission lines is now being produced by the Muter Company. The coupler is connected between the receiver and the bottom end of the lead in.

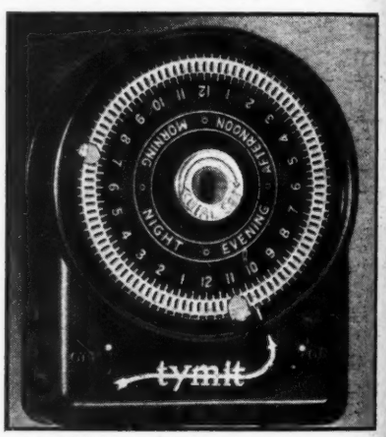
It is fitted with a three-position switch to provide the best impedance match to be made under various conditions and at different wavelength ranges. This coupler with a doublet type antenna and its transmission line is designed to minimize man-made static.

For Owners of 32-volt Power Plants

The Electronics Laboratories introduces a new d.c.-a.c. converter operating from 32 volts direct current and furnishing 110 volts alternating current output. The vibrator employs a new dual-action principle, with 4 semi-stationary reeds, and 1 vibrating reed. The input current at full load is 4 amperes and the output power 100 watts.

Switching Control for the Radio Set

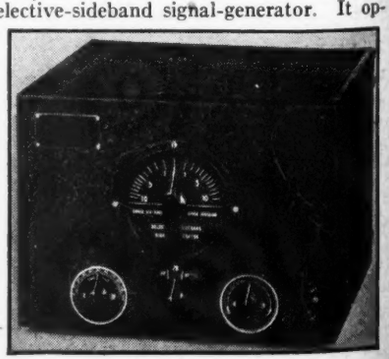
If you are looking for an automatic switching control to turn your radio set



or refrigerator, oil burner or any electrical appliance, on or off at a predetermined time the answer is found in the new Tork Clock Company's "Tymit" electric timing device. It is equipped with two pointers which can be set for the time of the day you wish some electrical appliance to start operation, and for the time that you wish it to be turned off. The control is available in two sizes, a 600-watt unit for all domestic uses and a 1500-watt instrument for oil burners and commercial applications.

A New Instrument for Servicemen

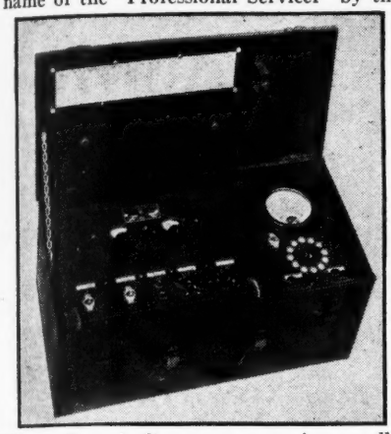
The Audio-tone Oscillator Company recently introduced their new model 30B selective-sideband signal-generator. It op-



erates at a fixed radio frequency of 600 kc. and has a directly calibrated, continuously variable modulated frequency range from 60 to 10,000 cycles. An instrument of this kind should meet a wide demand for production line and acceptance tests, and quick overall selectivity and response measurements.

Everything in The One Carrying Case

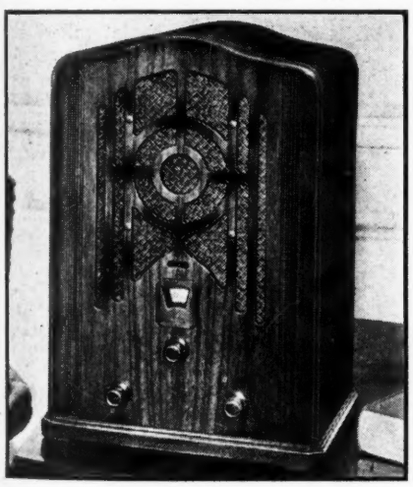
This new instrument produced under the name of the "Professional Servicer" by the



Clough-Brengle Company, comprises an all-wave signal generator and a multi-range volt-ohm-milliampere-output meter. The complete equipment is enclosed in a metal case fitted with shock-proof instrument cushions.

Battery Receiver

The latest addition to the Emerson line is a six-tube dual-wave battery-operated superheterodyne. In addition to the regu-



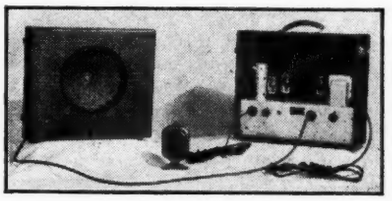
lar broadcast band it provides reception on the short wavelengths from 52 to 19 meters. It employs a permanent magnetic dynamic type speaker.

That Liquid Rubber You Have Been Waiting For

A liquid form of live rubber which is self-vulcanizing is now being produced by the Stewart's Studio. It can be applied right from the can with a brush, like paint, and drys very quickly taking the form of a durable, elastic, vulcanized rubber surface. While this product was primarily developed for use in flexible mold making to cast novelties from plaster, etc., it will appeal to radio experimenters and servicemen, as it is especially suitable for insulating tool handles, insulating wire connections, coils, and thousands of other radio uses which will suggest themselves.

Portable P. A. System

The RCA Victor 6-Watt portable sound system is especially applicable for use in window demonstrations, restaurant call systems, fairs, carnivals, etc. It operates



from 110 volts, 60 cycles a.c. line supply, weighs 28½ pounds and measures 16⅝ by 16 by 8½ inches. It has provisions for phonograph connections.

Television

(*Continued from page 77*)

forth a photo-electric effect when reaching the semi-conducting layer. Now the *D*-layer is granulated and uneven, hence the photo-electric effect can result but in certain points of the surface of the electrode *C*. Sure enough, there exist such parts of the surface, which do not touch the semi-conducting layer. Within these elements of surface no photo-electric effect can possibly develop. Since, in consequence to the photo-electric effect, electrons wander from the semi-conducting granules towards the metal electrode, the electrode *C* receives a negative electric charge, whilst the single granules, which have lost some electrons, are positively electrified. Thus it is evident that the phenomenon taking place in this case is similar to that in the so-called photo-electric elements (blocking-layer photo-cells). As to these, a potential difference results in them, between their conducting and semi-conducting layer, under the influence of light. This case would correspond to a situation, where a great number of galvanic elements of different electro-motive forces are put in contact—by their equivalent poles—with one common *C* electrode. The remaining poles of the elements, which in our case are represented by the semi-conducting granules, stay free. If now we switch the elements of different electro-motive forces, which are due to the photo-electric effect, one after another on the high resistance *R*, then for each photo-electric element we receive a decrease of voltage along *R*, according to the light-flux of the element. We accomplish this switching on of the elements one after the other with the help of a cathode-ray beam. This latter being directed in a zigzag line by the aid of two generators S_h and S_v, a small spot of this beam makes conducting connection between a group of the granules and the metal net *F*. Thus the electro-motive force, that results from the light influences, causes a current through a circuit, where the resistance of a small part of the cathode-ray beam, the resistance *R* and the internal resistance of the photo-electric element are connected in series. We amplify the decreases of voltage along the resistance *R* with the amplifier *H* and transfer them to the modulator, which then modulates the oscillator *O*. In this tube the cathode-ray beam starts from the cathode, passes the Wehnelt cylinder *W*, the grid and the anodes A_1 and A_2 and finally arrives between the two deflecting plates, which control it's horizontal and vertical movement.

The cathode-ray beam, sliding along the surface of the granulated semi-conducting layer, causes electrons to settle down on this plane, which produce a negatively-charged electric field of damaging influence between the electrodes *E* and *F*. This we stop by supplying the electrode *E*, which is also made out of a metal net and which is placed between the semi-conducting layer *D* and the electrode *F*, with a positive potential by the means of a battery, this potential being high compared with that of the emitting layer. The metal, of which the electrode *C*, and the semi-conducting material, of which the layer *D* consist, are both chosen in such a way, that the light-permeable coefficient of the quartz-plate *B* and the metal layer *C* compensate the selective photo-effect arising between *D* and *C*. The thus attained important result is, that a certain change of light-flux affects the same electro-motive force throughout all the spectrum of visible frequencies.

The device described here has, in comparison with the devices already known, the advantage, that the selective photo-effect can be reduced to a minimum, further, that within this system, on account of its relatively low internal resistance, a certain change of light-flux produces a greater change of photo-current, than with other types, i.e., the device seems to possess a higher efficiency than the constructions commonly used.

JOHN CHARLES THOMAS

BABS RYAN

PINKY LEE

ARLENE FRANCIS

Backstage in Broadcasting

Samuel Kaufman

THIS seems to be a season for radio singers to seek dramatic rôles. John Charles Thomas, for many seasons a featured radio singer, is now starred on the Vince Wednesday broadcasts (NBC) in a dual dramatic and singing rôle. The series entitled "Our Home on the Range" was especially written for the noted concert and radio star. Carson Robison, cowboy singer; Frank Luther, well-known radio tenor; Zora Layman, popular singer of Western songs, and William Daly's Orchestra participate in the programs.

BABS RYAN, long featured on the Fred Waring CBS broadcasts, has switched her microphone allegiance to NBC, where she is presented on the Eno programs with Hal Kemp's Orchestra Wednesday nights. Babs' brothers—Charlie and Little—are also billed on the Eno feature. Babs' real first name is Blanche and she hails from Davidson, Tennessee. She studied the piano as a child and was a competent player at the age of five. At twelve she led her own school orchestra. She made her professional début with her brothers in vaudeville.

MAX BAER has returned to the microphone as star of the "Lucky Smith" series presented over NBC Mondays under the sponsorship of Gillette Blue Blades. The heavyweight champion was assigned the rôle of a heroic private detective. During his period of training for the James Braddock fight, his broadcasts were picked up from an improvised studio at the Berkeley-Carteret Hotel, Asbury Park, New Jersey. This arrangement duplicated the fighter's 1934 radio set-up when he presented the "Al Harper" series for a tire sponsor from the same spot. Peg La Centra has the leading feminine rôle in the "Lucky Smith" sketches. A large supporting cast of dramatic and musical performers is utilized.

HORACE HEIDT and his Bragadiers a veteran theatrical troupe, recently launched a new CBS schedule under the sponsorship of the Stewart-Warner Corporation. The programs, presented Thursday nights, come from San Francisco. The troupe was formerly known as Horace Heidt and his Californians. It originated on the campus of the University of California in 1920. The unit includes twenty-seven instrumentalists, five vocal soloists, three combinations of soloists, a girl sextet, two instrumental soloists, a glee club and seven arrangers. A highlight of the program is the girl sextet—the Six King Sisters.

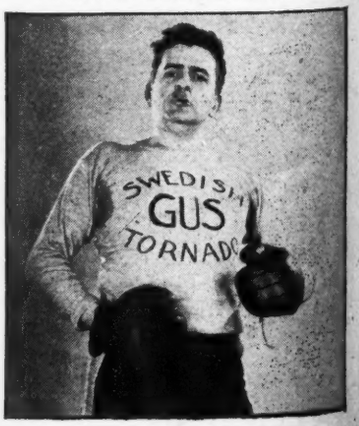
PINKY LEE, the "half-pint sailor" recently heard on NBC's Carefree Carnival programs from the Pacific Coast, was recently assigned to the Radio City studios in New York, and NBC officials believe the lisping comedy and song star will go far. Pinky's lisp is natural, but he said that he exaggerates it on the air. He was a child prodigy and appeared with one of Gus Edwards's famous troupes. His initial Eastern network assignment was a guest spot on Rudy Vallee's yeast hour.

TWO of radio's well-known personalities—George Frame Brown and Mario Chamlee—have formed the comedy team of Tony and Gus now presented daily (except Saturday and Sunday) over NBC. Brown, you may recall, was featured in the old "Main Street" and "Real Folks" series. Chamlee, the operatic tenor, met Brown at a Connecticut house-party and the pair put on an impromptu act in

MAX BAER

SIX SINGING SISTERS

GEORGE FRAME BROWN



HORACE HEIDT

Swedish and Italian dialects. The results were so hilarious that friends urged them to bring the idea to the air. And now, under the General Foods banner, they are doing that very thing.

ARLENE FRANCIS has succeeded Rosaline Greene as mistress of ceremonies of the Linit "Hour of Charm" of CBS. The program is now heard Tuesdays instead of Thursdays, the competition of Rudy Vallee's variety hour on NBC probably proving too stiff. The "Hour of Charm," which is really a half-hour despite its name, still features Phil Spitalny's all-girl orchestra. Miss Francis's appointment to the prominent program spot was preceded by many other radio achievements. "March of Time" and "Forty-five Minutes in Hollywood" were two of the programs she previously participated in.

IRENE RICH, one of the foremost screen performers of the silent era, has earned a high radio dramatic rating in recent seasons. As star of the air dramas presented over NBC Fridays under the sponsorship of the Welch Grape Juice Company, Miss Rich has earned a large and consistent following. Although featured over Eastern and Middle Western outlets for a year and a half, it was only recently that the West Coast chain stations were added to the Welch hook-up. A native of Buffalo, New York, Miss Rich moved to Idaho, spent a few years in Hawaii, entered the real estate business in San Francisco, and made pictures in Los Angeles. She made her radio début in Chicago and now resides in New York.

IRENE RICH

THE SERVICE BENCH

tells YOU something about

The Business End *of* SERVICING

Conducted by Zeh Bouck, *Service Editor*

¶ We have always maintained that the service office was just as important an adjunct to the successful service business as a well equipped service shop.

AS the readers of RADIO NEWS appreciate from past contributions, Hertel's Radio Shop, of Clay City, Neb., *is going places!* It is evident from Figure 1 that its proprietor, Roger Hertel, agrees with us on the business end of servicing. This office is neatly arranged—as well laid

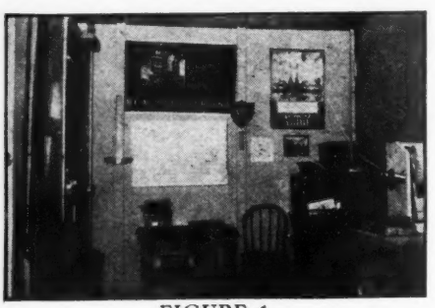
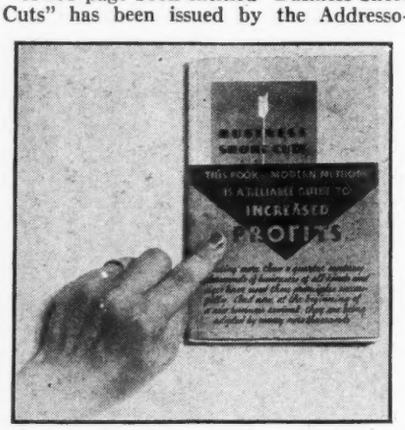


FIGURE 1

out as his service shop, illustrated in our June issue and repeated in this month's heading—and a complete library of service manuals is conspicuous on the desk top. We particularly like the adding machine, which, we have no doubt, is principally employed for totaling profits!

Modern Methods Increase Business Profits

A 152-page book entitled "Business Short Cuts" has been issued by the Addressograph-Multigraph Corporation, Cleveland, Ohio. It describes hand, electrically-operated and power-driven automatic addressing machines for business use. Some of the smaller hand or electric models are well



suited for large radio service organizations that regularly circularize their customers.

SERVICE SALES TIP!

The card in Figure 2 tells its own story and makes a first impression that is likely to be a lasting one on the prospective customer who finds it stuck on his parked car! Offhand, it might appear to be an unpleasant bit of reversed psychology, but the chances are that, after the first shock, the recipient is impressed by its cleverness rather than his heart-failure. Thanks to C. J. Schauers, of Price, Utah.

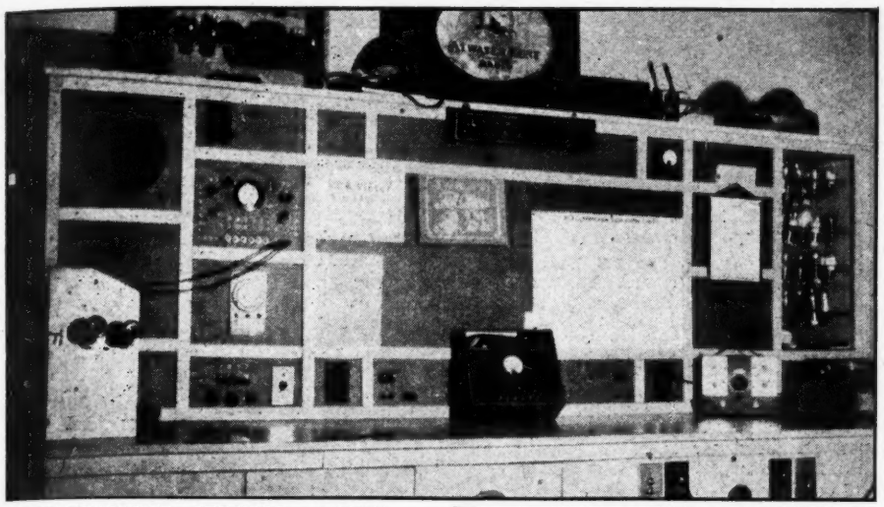
Figure 3 shows a sticker that can be

FIGURE 2

had for the asking from Tobe Deutschmann. It is just the right size, and in attractive colors, for sticking in the lower right or left corner of your letterhead—or in a blank space in your sales literature.

Service—Sidelines—Sales

Frigidaire announces a new "flowing cold-milk cooler" which should be a boon to the farmers and offers remarkable sales possibilities to the serviceman in the country. It is made in various sizes, holding



BUSINESSLIKE SERVICE BENCH

The Service Bench of Hertel's Radio Shop is well arranged and leaves plenty of space to work in.

from two to eighteen standard 40-quart cans. The milk is cooled down to fifty degrees within one hour after immersion, and by the simple elimination of rejections the refrigerator should cover its own cost as

FIGURE 3

well as operating expenses in the course of time. A particular feature is the self-leveling device which maintains the water uniformly around the necks of the cans,

FIGURE 4

regardless of how many cans are immersed. Newest among the rapidly becoming popular chest type refrigerators is the Crosley type EA-20. (Figure 4). Opening from the top, this refrigerator has a capacity of two cubic feet with 4.2 square feet of shelf space and the two ice trays hold one pound of ice each. The Crosley "Shelvador" feature is retained.

Cash Prizes for Servicemen

Every serviceman from time to time works out some idea which proves to be a business getter and brings in extra dollars. It is felt that through an exchange of such ideas servicemen readers of RADIO NEWS can cash in handsomely, and so RADIO NEWS plans to publish tried and proved suggestions along this line. To further this end, five cash prizes will be awarded each month, beginning with the August issue, for the most practical ideas submitted. The prizes are as follows:

FIRST PRIZE, $10

SECOND PRIZE $5 FOURTH PRIZE $5
THIRD PRIZE $5 FIFTH PRIZE $5

In addition to the prize-winning ideas, a consolation prize of $2 will be paid for each idea published. To enter this contest it is necessary only that you be actively engaged in some branch of radio service work. You can submit as many ideas as you want. Describe each one briefly and clearly on a separate sheet of paper and address them to the Service Contest Editor, RADIO NEWS, 461 Eighth Avenue, New York City.

P. A. Profits in the Small City

For the benefit of doubting Thomases in the matter of getting anywhere with public-address systems in communities smaller than 10,000 citizens, we publish the photograph of Figure 5 and the following communication from the proprietors of the Universal Radio Laboratory in Price, Utah: "We use our public-address system for crowds from 500 to 30,000. The complete outfit consists of five amplifiers, ten speakers, four microphones, one recorder, two pick-ups and turntables. The amplifiers in the photograph comprise a mobile public-address system using the latest type tubes, a shop-made 50 push-pull amplifier, a factory-constructed amplifier formerly used in talking pictures, and a small 45 push-pull amplifier designed for

(*Turn to page* 119)

RADIO PHYSICS COURSE

ALFRED A. GHIRARDI

Lesson 43. Reactances

WHILE in one sense reactance is like resistance, in that it opposes the flow of current, it is different in other respects. The ohmic resistance of a wire depends only on its material, length, area and temperature. A given wire has the same resistance whether it is straight or coiled up.

THE reactance of a wire increases if it is coiled up, and also increases if a good magnetic path through iron or steel is provided for its magnetic field. At low frequencies the *ohmic* resistance is independent of the frequency. The *reactance* increases directly as the frequency is increased, for then the magnetic field around the conductor varies a greater number of times per second and the wires are cut by it more frequently. The mathematical expression for the inductive reactance of a circuit is:

$$X_L = 2\pi f L$$

in which X_L is the reactance in ohms, π is a constant equal to 3.1416 (called "pi"), f is the frequency in cycles per second, and L is the inductance in henries. Stated in words, the inductive reactance equals 2π times the frequency times the inductance in henries. The mathematical derivation of this formula as well as that for capacitive reactance will not be given here. If the reader is interested in studying it, he will find it in almost any text on electrical engineering.

Very often it is necessary to quickly find the reactance of some particular inductor at some frequency. For this reason, the following table of reactances of inductance coils between 0.01 and 100 henries at frequencies from 60 to 100,000 cycles is given for convenience, since it eliminates the need for the calculation. From the above formula, it is evident that the reactance of a coil is directly proportional to the inductance of the coil and also directly proportional to the frequency. Doubling the inductance of the coil gives twice the reactance, and twice the reactance is also obtained if the frequency is doubled. Also, halving the inductance gives half the reactance, etc. If these factors are remembered it is a simple matter to calculate mentally, the reactance of any coil not given in the table.

For example a 10-henry coil has one-sixth the reactance of a 60-henry coil at say, 100 cycles. Since the reactance of a 10-henry coil at 100 cycles is 6280 ohms, it follows that the reactance of a 60-henry coil at the same frequency must be 6×6280, or 37,680 ohms.

The caiculation of inductive reactance may be illustrated by the following example: What is the reactance of a 30 henry filter choke coil at 60 cycles, neglecting its resistance? At 120 cycles?

Solution: $X_L = 2\pi fL$. At 60 cycles, $X_L = 2 \times 3.1416 \times 60 \times 30 = 11{,}310$ ohms. Ans. at 120 cycles, $X_L = 2 \times 3.1416 \times 120 \times 30 = 22{,}620$ ohms. It should be remembered that L in the above formula must be expressed in henries. The microhenry is so often used in practical work that one often forgets to change microhenries to henries when using this formula. Notice that the reactance or opposition to current flow is twice as much at 120 cycles as it is at 60 cycles. Notice also how much an inductor of only 30 henries opposes the flow of current. At 60 cycles it opposes it just as much as a pure resistor of 11,310 ohms would, and at 120 cycles, it opposes it as much as a resistor of 22,620 ohms would.

We have seen that the e. m. f. varies according to the angle through which the armature coil in an alternating current generator has turned. The e. m. f. passes through various "phases" corresponding to the various angles. The current also passes through "phases" just as the e. m. f. does. The term "phase" whether applied to voltage or current refers to the position in the alternating cycle. If there is only resistance in a circuit, the current is zero at the instant that the e. m. f. is zero, and it reaches its maximum value at the same instant as the e. m. f. It goes through its various changes in value and direction in step with those of the applied e. m. f. The current is then said to be *in phase* with the e. m. f.

When there is self-induction in the circuit, the current changes do not keep in step, or in phase, with those of the e. m. f. In a pure inductive circuit, the current changes are 90 electrical degrees out of phase with those of the applied e. m. f. Likewise, there is a difference in phase of 180 electrical degrees between the applied e. m. f. and the self-induced e. m. f. changes.

The case of a pure inductance thus far considered, is really an ideal case impossible to attain in practice, for it is impos-

TABLE OF INDUCTIVE REACTANCES

Coil Inductance in Henries	Reactance in Ohms at Various Frequencies (Cycles)						
	60	100	250	500	1000	10,000	100,000
0.01	3.77	6.28	15.7	31.4	62.8	628	6,280
0.05	18.8	31.4	78.5	157	314	3,140	31,400
0.1	37.7	62.8	157	314	628	6,280	62,800
0.5	188.5	314	785	1,570	3,140	31,400	314,000
1.0	377	628	1,570	3,140	6,280	62,800	628,000
2.0	754	1,256	3,140	6,280	12,560	125,600	1,256,000
5.0	855	3,140	7,850	15,700	31,400	314,000	3,140,000
10.0	3,700	6,280	15,700	31,400	62,800	628,000	6,280,000
20.0	7,540	12,360	31,400	62,800	123,600	1,236,000	12,360,000
30.0	11,310	18,840	47,200	94,200	188,400	1,884,000	18,840,000
40.0	15,080	24,720	61,800	123,600	247,200	2,472,000	24,720,000
50.0	18,850	31,400	88,500	157,000	314,000	3,140,000	31,400,000
100.0	37,700	62,800	157,000	314,000	628,000	6,280,000	62,800,000

Note: 1 Henry=1,000,000 michrohenries. 1 Kilocycle=1,000 cycles.

From the above formula, it is evident that the reactance of a coil is directly proportional to the inductance of the coil and also directly proportional to the frequency. Doubling the inductance of the coil gives twice the reactance, and twice the reactance is also obtained if the frequency is doubled. Also, halving the inductance gives half the reactance, etc. If these factors are remembered it is a simple matter to calculate mentally, the reactance of any coil not given in the table.

sible to have a circuit with zero resistance. It is closely approached however in certain inductor or choke coils, and certain transformer windings in which the resistance is very low and the inductance is very high due to the use of a fairly large number of turns of wire and a well designed magnetic core.

Service Income

(*Continued from page* 79)

baffle is obviously out of the question so unless we can install false wall sections in large rooms (and this is seldom practicable or desirable), it will be necessary to content ourselves with something less than the theoretical idea. As a matter of fact, since the problem will usually involve an average-size living room, which has limiting resonant qualities of its own, we can let these very low frequencies take care of themselves and design the baffle for a somewhat higher and more practical frequency limit.

Suppose we consider a tone frequency of 100 cycles-per-second. Here theory requires a baffle of only 36 square feet and the response curve will be improved if this is *not* symmetrical. This is an area within reason, particularly as it is permissible to utilize a small percentage of it in side surfaces which are not in the plane of our main baffle. Also, by placing the speaker below the center of the baffle area we can utilize the floor of the room itself.

Now as to the material to use for our baffle. It *should* have weight and it should *not* have resonant qualities. Remember, a sounding board is *not* desirable. We are seeking an accurate conversion into sound of complex electrical impulses which will be delivered to the speaker. Thus the baffle itself should not vibrate. If it does it may add its own characteristic vibrations and overtones to the reproduction. Nor do we wish the baffle to absorb the high or delicate tones. Therefore it *cannot have too great porosity* (softness). A baffle, for instance, built up of several thicknesses of corrugated cardboard is quite useless: musical reproduction loses all of its brilliance and even the speaking voice becomes flat and dead.

An excellent baffle which lends itself to many forms of installation may be made by bolting together two layers of "Sheetrock". This material comes in standard 4 foot by 8 foot sheets and consists of a layer of solid plaster between two beaverboards. It is commonly carried in stock by lumber and building supply companies who will cut it to your specifications. This makes a heavy, strong, non-resonant baffle which may be painted and finished in any manner desired. Moreover, it is not expensive.

The accompanying photograph and drawings illustrate one method of applying the above ideas. The writer has had this and other "bookcase baffles" built by local cabinet makers at prices ranging from twelve to twenty dollars, depending on size, arrangement and finish. It is one of the simplest and most acceptable ways of obtaining a large baffle area in a living-room. This particular job is finished in Chinese red on the outside and front edge of the shelves while the interior and baffle front is painted a dead black. The result is a piece of furniture which is acceptable in most any living-room. It can be built in various shapes and finished simply or richly to harmonize with the other furniture.

There are many other baffle ideas which can be worked out to meet a customer's specific requirements. Very often a corner can be utilized or waste space under a stairway walled off and used for the baffle. The important thing is to make the customer realize that the serviceman can give him *something out of the ordinary* in the way of radio reception and reproduction. Show him that each installation is an individual problem and let him feel that he is working with you in solving it. When the job is complete he realizes that he has something more than another "just ordinary" radio. Make him feel it is the *only one of its kind!* If it possesses individuality he can exhibit it with pride, feeling that he is partly responsible for its creation!

Extension Speakers

(*Continued from page* 80)

arousing the interest of passersby.

¶ SERVICING SOUND-MOVIE EQUIPMENT is profitable business and is often less difficult than many of the receiver-servicing problems which servicemen handle without trouble. Theater owners, however, may hesitate to entrust their source of income to any but a sound specialist unless confidence is first established by doing an easy job right. The installation of extension speakers presents no serious technical difficulties and therefore provides servicemen not only with a means of making a good profit but also of smoothing the way for further remunerative work. Figure 1 shows how this type of installation may readily be accomplished. There is usually a monitor speaker in the projection booth, which, in smaller theaters, is generally close to the front of the theater and the ticket office. The output of the sound amplifier is fed to the house and monitor speakers, a gain control consisting of a rheostat in series with the voice coil of the monitor speaker serving to maintain a low sound level in the projection booth. Leads from the voice-coil terminals of the extension speaker are simply connected in parallel with the leads from the output of the amplifier to the monitor speaker panel, as shown in Figure 1. This point of connection is shown because it is usually the most accessible and does not require removing screws or disturbing the apparatus in any way if a preliminary demonstration is insisted upon, which is usually the case. The extension speaker should have its own field supply and an 8 to 15 ohm voice coil.

Since the voice coil leads do not carry high voltage, it is unnecessary to have the wiring done by a licensed electrician. The power for the field supply may be obtained by plugging in to an outlet in the ticket office. If this power line is not exposed to rain, etc., and not permanently anchored by staples or otherwise, no violation will result in most localities, although it will be well to get a ruling on the requirements from the local inspector.

If it is desired to operate the extension speaker at a higher sound level than those in the theater, a T pad may be inserted in the theater speaker line and the extension speaker cut in ahead of the T pad. A variable series resistance in the voice-coil circuit of the extension speaker, controllable from the ticket office, enables adjustment of the sound level. The foregoing are somewhat out of the ordinary applications of the extension speaker.

¶ EXTENSION SPEAKERS IN THE HOME is an item often overlooked by servicemen, since we sometimes forget that the layman considers adapting a radio to operate two speakers to be a difficult and expensive task and therefore hesitates to make inquiry regarding same when they *really need and can afford them!* In hot weather, in suburban communities, one can enjoy an interesting program in comfort when an extension speaker is put out on the porch, but not in a stuffy room where the set is usually located. In winter, the same speaker may be pressed into service to avoid missing a good program during a dinner hour. (For the sick room, though the midget receiver is more desirable from the standpoint of convenience, discriminating listeners will appreciate the greater fidelity obtainable with a good extension speaker on a good set.)

For home installations, we may choose either permanent magnet dynamics, electro-dynamics, or magnetic speakers. The simplest and most economical method of adding another dynamic speaker to that in the set is shown in Figure 2. This method of paralleling the voice coils provides a low impedance line which not only carries very low voltage but also does not noticeably affect the fidelity of reproduction, which is not the case with the usual form of connection if the extension speaker is located at a point remote from the receiver. This method is used only when the set speaker voice-coil and that of the extension speaker are from 8-15 ohms. Methods of controlling volume at the extension speaker are indicated in the diagram, Figure 2. Ordinary potentiometers or rheostats of the values given will be satisfactory. The permanent magnet dynamic type of speaker has the great advantage that there is no field supply current which one may forget to turn off, unless extra switches, relays and wiring are provided. The electro-dynamic type provides the best power sensitivity and the magnetic type the lowest cost.

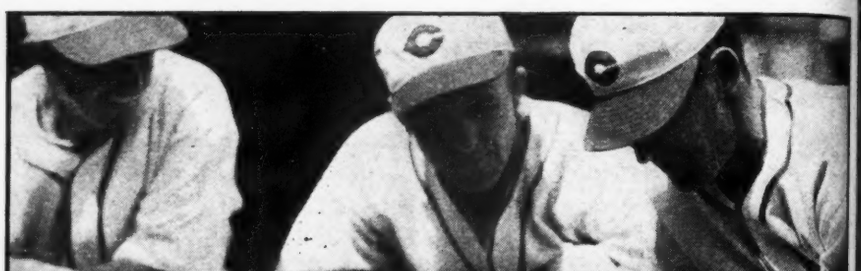
¶ WHEN ESTIMATING FOR TRADE-INS, it is well to bring up the suggestion to the customer of employing the speaker in his old set as an extension speaker, thus relieving one of the burden of resale of obsolete merchandise and at the same time benefiting the customer. The life of a good dynamic speaker is usually far greater than other component parts under electrical stress and when trade-ins are unavoidable, they may be salvaged and re-sold to the benefit of all concerned.

Electronically Controlled Photography

PITTSBURGH, PA.—By the use of electronic apparatus for controlling a special camera, a clear photograph of a bullet traveling 250 miles an hour was made recently by engineers of the Westinghouse Electrical and Manufacturing Company. A glow tube furnished the light for making the picture.

Coming Next Month!

Descriptions of a number of radically new sets.



QRD? QRD? QRD?

CONDUCTED BY GY

OUR West Coaster notes that a sudden and great improvement has taken place in the Airways by the way jobs are being picked up by operators. Many of the regularly and part-time employed are getting more money and some are going to the Far East. Some of those laid off in the airmail cancellations of 1934 find berths now in Hawaii, China, etc.

A STILL greater improvement is expected with the opening of scheduled runs on the Trans-Pacific lines to the Far East. Anybody interested in this phase of travel must know something about meteorology and, above all, must have plenty of good common sense. An airplane going around two miles a minute must get the true dope on direction, otherwise. . . . Catch on? There are some wage increases and, all in all, the airways have blossomed forth. Not *every* operator who holds a ship berth is good enough for the airways. In fact, the ratio thus far has shown that one in twenty are able to stand the gaff.

A lot of the ops in Southern California lost out on civil-service jobs on account of being unable to work a mill and bug. There are still a few land radio-telegraph circuits and these require a mill and bug and lotsa speed. So take the hint, youse guys who want to get a land billet.

The illustration in our heading this month seems to indicate that "Cincy," the mascot of the Cincinnati Reds, owned by Powell Crosley, Jr., is becoming a real radio operator. At any rate, he has the "cans" on his ears, even if he isn't an old "sea dog."

The broadcast sit'yashun remains the blackest part of radio—low wages, no decent hours, poor working conditions, *and all due to the inertia of the men themselves!* In the shipping industry the boys have all gotten behind the A.R.T.A. and have accomplished wonders in the short space of time they have been acting as a unified whole, but in the broadcast field there seems to have arisen dissension, as too many mouthpieces have been doing the planning and suggesting, and no actual progress has been made. We cannot understand why some of the ops employed at $70 per month must fib to a union or friend and say it is $250. The law does allow "window dressing" when talking to and trying to sell the girl friend—you know, *caveat emptor.*

Conforming to the general opinion of the bane of a columnist's existence, we herewith publish a few of the epistles which cross the old mahogany known commonly as the pigeon-holed desk: "Dear GY: Some time me think maybe radio operator on ship good job and me think maybe nice job for me. Here where we live are no purty gals and in picture books all operators have nice clothes with gals walking. Maybe you get me job like that too! How much cost? Please answer, because I would like to start soon on job. Thank you. . . ."

"Dear GY: We have been reading your column for the past few years and we believe it to be the finest and most well-balanced reading which it has been our pleasure to discover. Although the rest of the magazine is also very well put together, we know that none of it compares with yours. We cannot find anything to criticize in it and we think that the Editor should give you at least the last half of the magazine to publish your clever remarks. Now, we believe that a man with your capabilities is one who would be interested in this oil stock proposition which is herewith set forth, and we know you will immediately be able to see how profitable a small investment in it will become in the very near future," etc, etc.

"Dear GY: In reference to one of your sporadic remarks in a recent issue, we want you to know that we will not stand for anything like that in the future. We believe that if you had investigated the source of your information, you would have found out that your informant is a foe of this organization and therefore will do anything and say anything which will hurt our cause. You must have been crazy to have published this statement which has absolutely no foundation of fact, and al-

though an apology will not help very much now that the damage has been done, we demand it anyway. We know that you will not do anything like this in the future and therefore hold no ill-will towards you. . . ."

"Dear Sir: Could you recommend a good practical course for training wireless operators, as I am interested in becoming one of the brotherhood. I am interested in finding a school close to home, at least not more than ten miles away and one which will accept my high school credits. As I passed in physics (very high), I know that I will make a good operator, and I like the ocean and the large seagoing greyhounds. I once owned a canoe. I have a thorough grounding in radio as I can fix radios. Please answer via the enclosed envelope. . . ."

"Dear GY: Sometime ago I wrote you requesting some information which I have never received. That which I requested was . . . I cannot understand why I did not receive a reply, except perhaps that I inadvertently left out my home address. Kindly make a note of this, as I will request information from time to time and as a subscriber to your magazine I know that I will receive same. With many thanks. . . ."

It is with deep sorrow we must report the illness of our old friend, "HC" Chetham, who is now at the U. S. Naval Hospital, Chelsea, Massachusetts, having been operated on for war disabilities. He is in hopes that some of his old buddies will drop him a line or two. He is still chief of the radio station WPEH, Somerville Police. Here's hoping for a speedy recovery, old man, and we know the gang is with us in this.

Many blasts have been delivered to us, we and company by the mailman, and the foremost is that of R. E. Graham-Goodger, ZL2RP, Warpeekewau, New Zealand, who sends best 73 with the inclusion of the *Evening Post* from Wellington, showing its 70th anniversary. He hopes some of the gang will work him. . . . Miami, Florida, states, through J. N. Stoody, that things are practically "popping" down there and as soon as the WX gets warmer up No'th he's a-comin' back heah. . . . From Ventura, California, Keith Williams, who has been holding down a berth in Uncle Sammy's navy, sez, "I hope you'll pahdon this intrusion on your tranquillity by a young squirt, but I have some questions I have been trying to get the answers to and nobody seems to have them. So, having garnered the impression, after a couple years' reading your monthly blurb, that you might possibly know the answers, I'm asking you the questions." (Will reply by direct mail, OT—Ed.) And last, but not least, the tropics are calling, through H. Bigelow Poole, Jr., who is stationed down at the Subbase, Cocco Solo, Canal Zone. He requests ino as to the why and wherefore of the A.R.T.A., and that also is being shipped by return flyer, so adios and ge. . . . GY.

Capt. Hall's Page

(*Continued from page* 92)

States, ZEK can be heard from 6 to 7 a.m., atmospheric conditions being favorable. Announcements are always given in English, but the call ZEK is seldom used. It can be identified by the announcement, "This is the Hong Kong broadcasting station calling," followed by the call ZBW, which is the long-wave station that they relay.

A very interesting letter from a short-wave fan in Africa reached us, and he says, "If one of you fellows should tune in Johannesburg and hear an announcement in a strange language you might think you had Moscow on a new wavelength, but it is only 'Afrikaans.' You see, this country is bi-lingual and all station announcements must be made in English and Afrikaans."

Comparison of reception conditions from various parts of the country always prove interesting. When listeners on the East Coast are hearing the Europeans with R9 signal strength, we have found, through correspondence, that our "brother" listener located in the Middle West is receiving that same signal with R6-7 strength and that it continues to diminish in volume until the fan on the West Coast may not be hearing it at all. A short-wave fan who formerly was a resident of California was visiting fan friends who live in New York City. The first time the "Westerner" heard the "D" and "G" stations pounding in, as they do at this season of the year, he was dumbfounded. But when he heard the Frenchman on 25.63 meters transmitting until after midnight, and with good loudspeaker volume, he said, "Out West, we hear the Japanese stations that way, but never the foreign locals."

The Design of Crystal Filters

(*Continued from page* 89)

impedance which it faces, i.e., the plate-to-plate impedance of V_1. The impedance Z is given as a function of the frequencies f_1 and f_4 and of L in equation (1), Figure 4. Knowing the impedance Z, the inductance of the coils L may be derived from this expression.

The values of the capacities and inductances of the equivalent circuit are, in turn, functions of the inductance of L and the frequencies of resonance and anti-resonance. The derivation of the formulas which give these elements is beyond the scope of this paper; the mathematically inclined reader will do well to investigate the references given in the footnotes 3 and 4.

The elements of the equivalent circuit are given in Figure 4, equations (2) to (7).[3]

It will be noticed that there have been no definite values assigned to f_1, f_2, f_3, and f_4. It is true that f_2 and f_3 are the resonant frequencies of the line and lattice crystals, but this tells nothing of the relation between them. Obviously, from the equations given, many different structures might be derived which would have the same cutoff frequencies f_1 and f_4, but which might have impedance characteristics differing widely from the optimum. If these frequencies —f_1 to f_4 inclusive—bear a certain relationship to each other, such that they are a geometric series, the response of the filter closely approaches the ideal. This means, of course, that the ratio of each frequency to the preceding one is a constant (footnotes 5 and 7).

After determining the values of the elements of the equivalent circuit the size of the crystal is determined as in the case of the low-pass filter described in the previous article, by substitution in equations (1), (2), and (3) of the first article of this series. (In the next installment of this series the bridged-T-type filter will be discussed and illustrated.)

FOOTNOTES: 1. LACK, F. R. "Observations on Modes of Vibrations and Temperature Coefficients of Quartz Crystal Plates," *Bell System Technical Journal*, Vol. VIII, No. 3, pp. 515-535. July, 1929.

2. LACK, WILLARD, and FAIR. "Some Improvements in Quartz Crystal Circuit Elements," *Bell System Technical Journal*, Vol. XIII, No. 3, pp. 453-463. July, 1934.

3. FOSTER, R. M. "A Reactance Theorem," *Bell System Technical Journal*, Vol. III, No. 2, pp. 259-267. April, 1924.

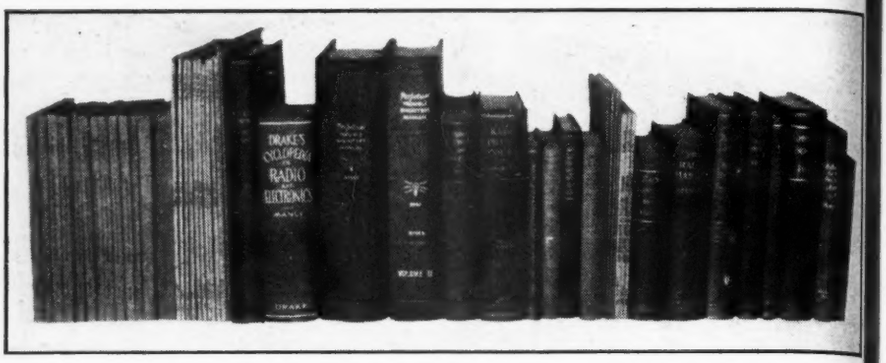
4. JOHNSON, K. S. Transmission Circuits for Telephonic Communication. New York, D. Van Nostrand Company. 1927. pp. 304-312.

5. BODE, H. W., U. S. Patent 1828454. This patent describes another method for spacing the frequency to maintain high attenuation outside of the transmitted band.

6. MASON, W. P. "Electrical Wave Filters Employing Quartz Crystals as Elements," *Bell System Technical Journal*, Vol. XIII, No. 3, pp. 405-452. July, 1934.

7. MASON, W. P., U. S. Patent 1967249.

8. MASON, W. P., U. S. Patent 1967250.



THE TECHNICAL REVIEW

CONDUCTED BY ROBERT HERTZBERG

Specialized Auto Radio Manual, Volume II, by John F. Rider, published by John F. Rider, 1935. This is the second volume of the Auto Radio Manual, which was prepared for servicemen who specialize in auto radio work. It would be a hardship to these men if they had to buy all five volumes of the Trouble Shooter's Manual just to get the auto-radio data, so this volume contains all the auto-radio data found in the last Trouble Shooter's Manual, plus some new diagrams which have appeared since the Trouble Shooter's Manual went to press.

The book contains numerous diagrams of automobile receivers, with values of resistors and condensers marked on it. Correct voltages are shown on many diagrams. In addition there is valuable information on the installation and servicing of these receivers. The average space per model has increased considerably since the old Vol. I of the Trouble Shooter's Manual was released.

Radio Design Practice, edited by J. Millen. Published by James Millen, Inc., 1935. This book represents a new departure in presenting essential information to the radio designer. It contains all electrical and mechanical characteristics of parts and equipment manufactured by several companies. Radio parts such as condensers, transformers, etc., are drawn to scale, giving the physical dimensions needed to plan a complete layout. Electrical characteristics are also given. Apparatus which is sold complete has been included, with a general description.

Sprayberry Voltage Tables, published by F. L. Sprayberry, Washington, D. C. This book, which every serviceman will want to own, is devoted entirely to voltage tables for hundreds of different broadcast receivers. Its compilation must have taken a great amount of time and effort. An index in the back makes the finding of any particular table quick and easy. The first 16 pages of the book are given over to a brief review of voltage analysis, with suggestions as to the proper use of various measuring instruments.

Review of Articles in the May, 1935, Issue of the Proceedings of the Institute of Radio Engineers

Radio Developments During 1934. A five-part review of technical progress. A very interesting historical compilation.

Five-Megacycle Standard-Frequency Transmissions, by E. L. Hall. Since 1931 the Bureau of Standards, through station WWV, has been transmitting standard frequency signals for the purpose of furnishing an accurate frequency standard for the public. This paper analyzes 2900 reports and brings out the fact that the service has been highly satisfactory.

The Eclipse of August, 1932, Observed by Radio Facsimile, by E. F. W. Alexanderson. In connection with the 1932 eclipse, physicists displayed a great deal of interest in the theory of the corpuscular shadow during the two hours before the optical eclipse. A radio-receiving station equipped to take continuous facsimile records of signals from a Schenectady transmitter was therefore set up at Conway, N. H. This paper contains samples of the records and interprets the phenomena observed.

Propagation at a Wavelength of 73 Centimeters, by B. Trevor and R. W. George. Field tests made with improved equipment show the nature of 73-cm. propagation over distances up to 175 miles. Below the transmitter's horizon, rapid attenuation occurs with increase in distance from the transmitter, the plane of polarization of the signal remains unchanged and various types of fading are observed.

Series Modulation, by Charles A. Culver. The author points out that the type of modulating system used in any given case depends to some extent upon the particular type of service involved. The limitations of existing types of control are discussed, and a detailed theoretical and experimental investigation of the so-called series type of modulation is reported.

An Analysis of Class B and Class C Amplifiers, by Burton F. Miller. Probably no single technical topic has produced as much discussion as the matter of amplifier operation and designation. The author of this paper gives a mathematical analysis of the plate-current flow in Class B and C r.f. power amplifiers, due consideration being given to the nonlinearity of tube characteristics.

Review of Contemporary Literature

Debunking "Tuned" Feeders, by Robert S. Kruse. "R/9", May, 1935. As a result of considerable experimenting, the writer states that transmitting antennas are not nearly as critical in length as believed, and that wires shorter or longer than the theoretically correct length can be adjusted electrically without any trouble.

An Improved Audio Oscillator, by H. W. Lamson, General Radio Experimenter, May, 1935. Description of the redesigned G.R. Type 213 audio oscillator, for many years the standard laboratory source of audio tone for measurement and other purposes.

A Small Radio Transmitter for Police Duty, by F. E. Nimmcke. Bell Laboratories Record, May, 1935. Technical data on a 100-watt phone transmitter of simple, compact design.

Looking Over the Circuits of the New Amateur Band Superhets, by James J. Lamb. QST, May, 1935. Circuit diagrams and brief descriptions are given of eight of the latest short-wave receivers.

The Transient Aspect of Wide-Band Amplifier, by O. S. Puckle. The Wireless Engineer, May, 1935. A means of examining the behavior of wide-band amplifiers when supplied with transient input waves is described, and the results obtained with a particular resistance-capacitance coupled television amplifier are given. Of interest in view of recent television developments.

The Cathode-Ray Oscillograph, by J. P. Allen. Broadcast News, April, 1935. Detailed description of the RCA Cathode-ray oscillograph, with suggestions as to its use for various test purposes.

Cathode Ray Tube Applications, by J. M. Stinchfield. Electronics, May, 1935. Ten different uses for the versatile cathode-ray tube, other than the measurement of voltage, current and wave form, are described in detail and circuit diagrams for practical use are given.

Antenna Switching, by Arthur G. Manke. Radio Engineering, May, 1935. Description of a new antenna switching device for all-wave receivers that provides maximum performance in all bands.

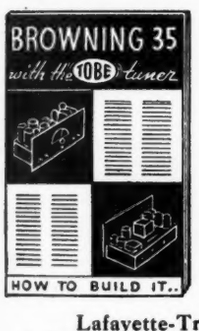
Vacuum Tube Voltmeter Applications, by Kendall Clough. Service, May, 1935. Although most service men are acquainted with the functioning of the vacuum-tube voltmeter, few realize how extensively it can be used for everyday testing operations. The author outlines many such applications.

Multi-frequency Ionosphere Recording and Its Significance, by Theodore R. Gilliland. Research Paper RP769 of the National Bureau of Standards. Results obtained in hourly measurements of critical frequencies of the layers of the ionosphere are presented for the period of a year between May, 1933, and April, 1934.

First Annual Statistical Number, prepared by the Electrical Division of the Department of Commerce. A 36-page multigraphed folder of considerable interest to executives of the radio and electrical industries.

Data on the Browning "35"

A data sheet containing circuit diagram, frequency response curves and a description of the Browning "35" receiver has been issued by the Tobe Deutschmann Company. Readers can obtain copies free by writing to RADIO NEWS, 461 Eighth Avenue, New York City.



Lafayette-Trutest Catalog

A 128-page summer catalog, No. 57, has recently been completed by Wholesale Radio Service Co., Inc. This lists radio parts, accessories, receivers, short-wave receivers, transmitters, public-address amplifiers and other outfits. Useful to every radio serviceman, experimenter and amateur. To get a copy free, write to RADIO NEWS, 461 Eighth Avenue, New York City.

Information on a Multi-Purpose Tester

Through the courtesy of the Supreme Instruments Corporation, this 15-page booklet is offered gratis to all our readers. The book contains descriptive information and circuit diagrams on their new model 385 Automatic Tester. This is a multi-testing unit featuring simplicity of operation. Address request to RADIO NEWS, 461 Eighth Avenue, New York City.

Condenser Catalog

Servicemen, amateurs and experimenters should find the 1935 condenser catalog of the Cornell-Dubilier Corporation, of interest and value. To obtain a free copy, write to RADIO NEWS, 461 Eighth Avenue, New York City.

Condenser Folder

A new folder entitled "Facts You Should Know About Condensers" has just been issued by Sprague Products Company. This should prove both interesting and helpful to all users of condensers because it tells how to determine the quality of dry electrolytic type condensers from the factors of leakage, power factor, capacitance and voltage. It contains interesting tables and test data. A copy of this folder is

available to our readers free of charge. Address requests to RADIO NEWS, 461 Eighth Avenue, New York City.

RADIO NEWS Booklet Offers Repeated

For the benefit of our new readers, we are repeating below a list of the valuable technical booklets and radio manufacturers' catalog offers, which were described in detail in the June and July 1935 issues. These booklets (J1 to J9 and Jy1 to Jy5) are available to our readers free of cost. Simply ask for them by their code designations and send your requests to RADIO NEWS, 461 Eighth Avenue, New York, N. Y. The list follows:

J1—Information on the Cornish Wire Company "Noise-Master" Antenna Kit, Free.

J2—Booklet describing the technical features of the Hallicrafters' "Super-Skyrider" short-wave superheterodyne. Free.

J3—New 1935 catalog of the Hammarlund Manufacturing Co. Free.

J4—Resistor catalog of Electrad, Inc. Free.

J5—Booklet on tube testing prepared by Supreme Instruments Corp. Free.

J6—"Practical Mechanics of Radio Service," issued by F. L. Sprayberry. Free.

J7—New 1935 parts catalog of Alden Products Co. Free.

J8—Practical ham antenna design folder and leaflet on a new auto-radio under car antenna system, published by Arthur H. Lynch, Inc. Free.

J9—Information on new radio courses given by the Capitol Radio Engineering Institute. Free.

J10—"Radio Noises and Their Cure." A 75-page book. Price 50 cents.

Jy1—Amateur Station Log issued by Weston Electrical Instrument Corp. Free to licensed amateurs. (Show call letters.)

Jy2—New parts catalog of Birnbach Radio Company. Free.

Jy3—Data on Vacuum Tube Voltmeter Measurements published by Clough-Brengle Company. Free.

Jy4—"Increasing the Serviceman's Income," folder issued by Philco Radio & Television Corp. Free.

Jy5—Transformer Bulletin of American Transformer Corp. Free.

World Largest All Wave Set

(*Continued from page 72*)

simultaneously by a single control through a worm gear reduction drive. There are eight additional fixed tuned selective circuits in the intermediate-frequency amplifier. It is such refinements in equipment that make practical the efficient sharp tuning required in the high-frequency bands where channels are so close to each other.

The short-wave set is contained in a cabinet, about 7 feet high, containing a number of panels of sensitive equipment. Its first units are three amplifiers covering, respectively: 2200 to 6000 kilocycles; 6000 to 13,000 kilocycles, and 12,000 to 25,000 kilocycles. Five circuits tuned to the desired signal single it out and then it enters a vacuum tube which reduces it to a frequency of 385 kilocycles. The signal then passes to an intermediate-frequency amplifier where its energy is amplified about 100,000,000,000 times. A high-fidelity detector valve transforms this radio frequency into audio frequencies which cover the wide tonal range essential for faithful sound reproduction. Once again, the signals are amplified and pass into the hotel's 6-channel program-distribution system.

This elaborate all-wave system at the New York hostelry is a tribute, indeed, to the growth and popularity of short-wave DX programs.

V. T. Voltmeter

(*Continued from page* 85)

and grids of these tubes. Since the potential of the grids is 12 volts less than the potential of the cathodes, the grid bias is 12 volts negative with respect to the cathodes. Similarly, the potential difference between the cathodes and plates of the 6C6 tubes is 370 minus 130, or 240 volts, less the drop across R5.

Now let us assume a minute alternating voltage to be applied across the terminals A-B, in Figure 1. There will be an increase in current flowing to the diode plate to which C1 is connected, causing an increased voltage drop across R1, and therefore a larger negative bias on its associated control grid. The plate current and, consequently, the voltage drop across R3 will decrease. Since the grid voltage of the following 6C6 is determined by the voltage drop across R3, this grid will acquire a potential less negative with respect to its cathode, increasing the plate current of the 6C6 and therefore the voltage drop across C-D. Since no appreciable change occurs in the lower half of the circuit as a direct result of the applied voltage, the voltage drop across C-E remains substantially constant. Since there is now, however, a potential difference between points D and E, current flows through the meter.

Diode rectification is usually avoided in vacuum tube voltmeter circuit designs. For large voltage inputs, as is well known, the resulting current curve is substantially linear when high fixed resistance is included in the circuit. For detector purposes, this characteristic is desirable and has resulted in its wide adoption in receivers. Such receivers require specially designed diode input circuits because, for large input signals, the diode draws appreciable power from the source. For tube voltmeter work, the function of the tube is not to detect, but to rectify the impressed voltage, therefore C1 must have negligible impedance, even at audio frequencies. If calibration of the tube voltmeter is made with alternating voltages of sine wave form, the accuracy of this calibration for irregular wave forms is dependent upon the slope of the plate-current—plate voltage characteristic (in the case of a diode) between the maximum and minimum points reached by the peak voltage applied. It has been shown mathematically that when the change in current is proportional to the square of the change in applied voltage, the sine-wave calibration will likewise hold for voltages of unsymmetrical wave form. In the case of a diode rectifier with high resistance in the circuit, the characteristic curve traversed by a high applied voltage is substantially linear over a large portion. Under such conditions, applied voltages with even harmonics will give different readings from the sine wave calibration. For very small applied voltages, however, the diode acts as a square-law rectifier and is therefore not subject to wave-form error. By using this portion of the characteristic, and adding a direct-coupled amplifier, it has become possible to take advantage of the simplicity and stability of the diode rectifier without its usual drawbacks. Likewise, when very small voltages are applied, the impedance of the diode is high and therefore little load is placed on the circuit.

The self-calibrating feature is illustrated in Figure 3. A separate 5 volt winding is supplied on the power transformer used in the power supply for this instrument. R1 is adjusted until full scale deflection of the a.c. meter is obtained. The voltage drop across the 400 ohm potentiometer

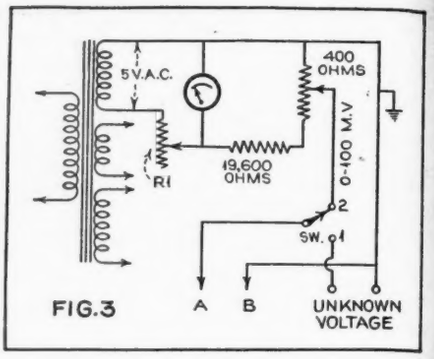


FIG.3

will then be 100 millivolts. A 100 division dial will then read 1 millivolt per division. Placing SW1 on point 1, the unknown voltage is applied across the input terminals and the reading of the d.c. meter noted. SW1 is then placed on point 2 and the 400 ohm potentiometer adjusted until the same reading is obtained on the d.c. meter. The dial reading of the potentiometer then shows the value of the voltage under measurement.

In the development of this tube voltmeter, particular attention has been devoted to confining the rectification to the diode circuit. The 6B7 pentode has no tendency to rectify, therefore, any a.c. which should appear across R3, in Figure 1, may be by-passed. This leaves only pulsating d.c. to be applied to the 6C6. With rectification confined to the simple diode circuit, and care as to input circuit components, a reasonably flat characteristic as to frequency response is obtained. At the moment of writing, tests so far have shown no falling off in sensitivity such as might be expected, even at 25 megacycles. In fact, a slight increase was noted, which was believed due to the test conditions.

This apparatus may also be used as a voltage amplifier, with an equally broad frequency range, by slight circuit modification.

The constructional details, with a complete circuit diagram, and additional applications of the device, will follow, probably next month.

Network Design

(*Continued from page* 90)

draw a line from the point on scale "A" equal to the line impedance Z_2 (600 ohms) through the point on scale "D" equal to the attenuation (30 decibels); continuing this line to meet scale "F" gives the value $R_b + R_c$ (600 ohms). Subtracting the value of R_c leaves the value of R_b (593 ohms).

4. To find the value of R_a (the other series resistance), the line impedance Z_1 (20 ohms) is used on scale "A" and the value of $R_a + R_c$ is found as in 3 to be 20 ohms. Subtracting R_c leaves R_a equal to 13 ohms.

In practical problems it is sometimes necessary to have both sides of the line at the same potential with respect to ground (when the end impedances are both balanced with respect to ground). This can be accomplished when matching or attenuating pads are used by center-tapping and grounding the shunt resistance; the series resistances are divided in two, half going on each side of the line. For instance, the "H" pad in Figure 6 is electrically equivalent to the unbalanced "T" pad of Figure 5.

In case the line impedances are such that they fall outside of the chart's range, they may be brought into its range by dividing (or multiplying) the impedances by a multiple of ten.

France Deletes Radio "Ads"

PARIS, FRANCE—Advertising has now been completely banned from radio programs of all governmental radio transmitters in France. This move is said to be the starting point of a thorough renovation of the entire French radio regime. In the future all broadcast material will be of the so-called "listener interest" type with no advertising.

The Service Bench

(*Continued from page* 111)

line boosting and recording. The baffled speakers are occasionally supplemented with horns. Our system is employed to plug merchants, bargain sales, for dances, elections, campaigning, to advertise new cars for local dealers, coming theatrical attractions—in fact, anything that finds place for a highly effective p.a. system. This may give some of your readers an

FIGURE 5

idea of what technicians can do in a small town of 6000 if they *get in and try!*—Charles J. Schauers and John Hubert Knight."

We don't doubt it! Figure 2 is another example of this shop's enterprise.

THE DAY'S WORK

L. C. Warren, of the United Radio Service, Sioux Falls, S. D., a specialist in auto-radio installations, passes on the following dope concerning—

Brake Noises

"Brake noises stump many technicians. I have used the cure described below for a couple of years and have found it 100 percent effective. The cause of brake noise is static electricity built up by the friction between the brakes and the drum. It is noticed at speeds in excess of twenty miles an hour—particularly in dry weather. The noise immediately stops when the car is driven on a dirt road.

"At moderate speeds, the lubricant in the front wheels electrically insulates the axle from the wheel. The whirling wheels set up a static charge which leaks through to the chassis. The remedy is simple, but you must get at the cause, not the effect. Merely remove the two front wheels and mix a good handful of flake graphite with the grease in the bearings. This provides an electrical path for the charges. The rear wheels have sufficient contact through the driving mechanism and have never given this sort of trouble, to the writer's knowledge."

Neon Tester Still on the Mat!

Reverberations continue coming through the mail from servicemen who have constructed the neon lamp condenser tester described in our January number and further discussed in the April issue. The transformer recommended in the original article was wound on the core of a discarded

(*Turn to page* 125)

The DX Corner
(Short Waves)

(Continued from page 99)

W9XAA, signals and programs, reported heard on 12160 kc., must be a harmonic of its 49-meter transmission. (Young, Libby, Myers, Jensen).

W9XBY, Kansas City, Mo., 1530 kc., 1000 watt is the high-fidelity station of First National Television, Inc., and is heard after midnight, E.S.T. (Johnson, Musser, De Laet, Schumacher, Deitenback, Kentzel, Shiedd, McKnight, F. H. Smith, Edquist, Phair, Twomey).

W2XHI, will be new call letters for WOR'S new short-wave outlet which will be completed around 1st of October (Scala).

W3XL, Bound Brook, N. J., reported testing 17310 kc., midnight to 2 a.m., E.S.T. (Boatman).

W4XB, Miami, Florida, 6040 kc., heard again after two years off the air (Johnson).

W1XAL, Boston, Mass., is reported heard now on 11790 kc., 8:30 to 9:30 p.m. E.S.T. (Kenny, Cristoph, Chambers, Myers, Gallagher, Sholin).

W8XAI, is reported to be short-wave station, 4100 kc., relaying WHAM Rochester.

CJRO and **CJRX** are reported to be on the air from 8 p.m. to midnight E.S.T. (Bower).

TFK, 9.06 megacycles heard Mon. and Friday 9 p.m. to 12 midnight E.S.T. (Sholim, J. E. Moore). Frequencies for two more Icelandic station, TFJ, 12235 kc., and TFL, 5008 kc., (another report says 5090) this station uses 8.5 kw power—Listen for them and be first to catch them on the air. (McMahon, Kalmbach, and Sholim).

XECW, Mexico City, Mexico, 5975 kc., reported heard 10:30 to 12 midnight E.S.T. (Hughes, Gomez, Jensen).

XECR, Mexico City, Mexico, 4016 meters, 7380 kc. reported heard 6 to 7 p.m. E.S.T. Sundays only (Hughes, Johnson, Cummins, Whitehair, Kenyon, Foshay, Gomez, Libby, Bower, J. E. Moore).

XDA, Mexico City, Mexico, operating on 5860 kc., heard 10 p.m. to 1 a.m. E.S.T. (Flick, Saldana).

HI4D, San Domingo, D. R. has changed its wavelength to 45.7 meters, about 6555 kc. (Libby).

T1RCT, Costa Rica, D. R. operating on about 45 meters, reported heard at 8:03 p.m., E.S.T. and 9:50 p.m. E.S.T. (Messer). Observer Saldana gives call as T1REC, on 6730 kc, signing off about 8 p.m. Are these two the same station? Get identification of either or both and schedules.

TI2RC, San Jose, D. R., 7150 kc reported heard 10:10 p.m. E.S.T. (Jensen).

TI20FR, San Jose, D. R., 7250 kc. 10:15 p.m., E.S.T. (Jensen).

TIPG, San Jose, D. R. reported testing 6550 kc. irregular, evenings. (Ware).

TIRCC, San Jose, D. R., reported transmitting, daily, from noon to 2 p.m. and 6 to 7 p.m. E.S.T. Our old friend Mr. Cespedes Marin is the speaker and operator (Palacio).

HI1J, San Pedro de Macoris, D. R., 5860 kc. reported at 6:30 to 9:30 p.m. E.S.T. (Ware, Betances).

HIH, San Pedro, D. R. reported heard Sundays from 3 to 4 a.m. E.S.T., 4 to 5 p.m. E.S.T. and daily, from 12:30 to 2 p.m. E.S.T. and from 7:15 to 8:30 p.m. E.S.T.

The call letters and frequencies of the new Haitian station reported experimenting since April are: HH2T., 25.9 meters, 11790 kc., and HH2R, 31.44 meters, 9545 kc. and HH2S, 49.41 meters, 6070 kc. schedule not fixed yet. (Palacio).

HH2R, Port au Prince, Haiti, has been reported on 9534 kc, 31.5 meters (Sholin).

HH2F, has been reported heard on 6070 kc. 8:45 p.m. (Betances). This latter call must be HH2S. The "S" or "F" may have been mistaken in either one of these two reports.

L. P. O. Allen E. Smith says: T1PG is correct for "TITE" The amateur call is "T12PG". ?

HC2AT, Guayaquil, Ecuador, 8400 kc., 15 watts, reported on the air, 7 to 9:30 p.m. E.S.T. (also reported on air at 8-1 p.m. E.S.T. Allen E. Smith). In both cases this is, daily, except Sunday. Station increased its power in June.

HC2JSB, Guayaquil, Ecuador, is reported to have changed its frequency to 7830 kc and to be on the air, daily, 7:20 to 11:20 p.m. E. S. T. (J. E. Moore, Ware).

HC2RL, Guayaquil, Ecuador, is reported on the air on 6620 kc., with a new Sunday schedule, 7:45 to 10:45 p.m. E.S.T. It also maintains its regular Tuesday schedule, 9 to 11:15 p.m. E.S.T. (Lussier, Hynek, Davis).

HCJB, Quito, Ecuador, reported as changing wavelength to 36.5 meters, 8214 kc, on the air Sundays from 4 to 10 p.m. Ecuador time. Other schedule remains same. (Faber, Saldana, Johnson, Shepherd, Gallagher, Wilson, Libby, Howald, Peters, A. E. Smith, Betances).

HCETE, Quito, Ecuador, 6976 kc., reported heard, 9:30 to 10:30 p.m. E. S. T. (Wree).

TGX, Guatemala City. Observer Hughes gives all TGX programs two hours later than shown in the Time Table. Obviously one must be wrong.

HP5J, Panama City, Panama, 31.28 meters 9590 kc. 100 watts, soon to be raised to 1000 watts, reported on the air, daily, 11:45 a.m. to 1 p.m. E.S.T. from 7.30 to 10 p.m. E.S.T. (Libby, Wood, Sholin, Irving, V.D.S.).

COH, 9428 kc, has been reported on the air at 10:00 p.m. (as late at 11:30 p.m., by another until 1 a.m. Saturday nights, and still another observer gives daily 10 a.m. to 12 noon, 4 to 6:30 p.m., 8 to 10 p.m.) all times E.S.T. Another observer definitely states they operate from 11 to 12 midnight. (Lussier, de Laet, Harvey, Hynek, Whitehair, Clarke, Coover, Duncan, Libby and Dirkes).

CO9WR, Sanctus Spiritus, Cuba is reported to be a new short-wave call of CMHB (the long wave station reported testing on 29 meters). They have been reported on the air from 5:45 to 6 p.m. on 10200 kc. Also have been heard, from 1 to 3 p.m. E.S.T. (Wredburg Polm, McMahon, Winand, A. E. Smith, Myers). One Observer reports this station heard at 3:30 to 4 p.m. and still another 6:30 to 7:05 p. m. They are using 100 watts and from these reports it looks as though they have been on the air at different times from 1 to 7 p.m. No definite schedule has been decided on.

HJ5ABC, Cali, Valle, Colombia, on

the air with a frequency of 6150 kc., 100 watts, power, daily, 11 a.m. to 12 noon E.S.T., Mon, Tues, Wed., Friday and Sun. from 7 to 9 p.m. E.S.T. On Sun. from 12 noon to 2 p.m. E.S.T. (Palacio).

HJD, Bogota, Colombia — All reports for this station should be sent to Minister of War, in Colombia.

HJ1ABJ, Santa Marta, Colombia, 50.42 meters 5950 kc. on air 11 a.m. to 1 p.m. and from 7 to 11 p.m. E.S.T. (Hughes).

HJ1ABE, Cartagena, Colombia, reported on the air, Mon. 10:30 to 11:30 p. m. and from 2 to 2:30 p.m. E.S.T. Sundays. (Belanger, Foshay, Bower, Lussier, Sholin).

HJ4ABL, Manizales, Colombia, reports a change in frequency 49.18 meters 6065 kc., on the air, from 11 a.m. to noon, 5:30 to 7:30 p.m., 10.30 to 11:30 p.m. (English Program and also from 11:30 to midnight E.S.T. with a DX program (Lightbourn, Cassidy, Capt. Hall, Myers, McCracken).

HJ4ABB, Manizales, Colombia (under same ownership as HJ4ABL) is now on the air 49.10 meters, instead of 42 meters and has been heard, 10 to 11 p.m. E.S.T. Sat nights. From 10 to 10:30 on Wed. nights a Spanish class is held. (Foshay). Observer Cummins says he heard the same station announce as JH4ABN. Still another observer asks, "What is the station or stations 6070—6050, 6100 kc?" There seems to be a scramble as to station and whether it is HJ4ABB or HJ4ABN or HJ4ABL (Betances). Here's the same old trouble up again with another station thrown in! (Editor)

HJB (also reported as HKB reported testing 8:30 p.m. E.S.T., 8800 kc., (Wood). Observer Belt gives the call as HKB, frequency 8880 kc. and time at 6:15 to 6:45 p.m. E.S.T. (Observed Sholin reported a station HKV in Bogota, 8620 kc. 6:30 p.m. E.S.T. and Observer Gallagher says this station operates on 8.8 megacycles at 8 to 8:15 E.S.T.

(*Turn to page* 124)

Simplified World-Time Chart

ONE of the finest Time-Conversion Charts that have yet been produced is a compact little affair which was developed and patented by Lieut. Charles M. Thomas, of the U. S. Coast and Geodetic Survey. This is a colored chart 9 inches by 12 inches in size.

No figuring or computation is required to use this chart. It does not, like many other systems, give only the time difference between definite points in the world, but actually gives the time for any hour, day or night.

Through a special arrangement with Lieut. Thomas, RADIO NEWS can supply these charts to readers. If you are interested in having a copy, address a request to RADIO NEWS, Department TC, enclosing 25 cents.

Club News

(*Continued from page* 99)

secure the Club emblem to identify themselves as members of the Society of Wireless Pioneers in radio gatherings, etc. Here's the dope. These emblems may be obtained for the office of the Vice-President in a rolled gold plate by sending in 50 cents for each pin. The sterling silver pins cost 30 cents apiece, while the best type, in rolled gold, cost $9 for the first dozen with additional pins 60 cents. It will be necessary to have an order for at least a dozen pins of any one type before an order can be placed. Send your orders to the Secretary, c/o RADIO NEWS and they will be forwarded to the Vice-President.

Pacific Station Short-Wave Club

In a news bulletin from George Sholin, charter member of this Club he informs us that it has been merged with the I.D.A. and invites new members to join. New members will receive the organization's Globe Circler and a regular monthly bulletin for members on the Pacific Coast will be made up in California for reception conditions there. The bulletin will be entitled "The Circlette" and will be sent to all I.D.A. members in this district. For further information, write to Mr. Charles A. Morrison, President of the I.D.A., c/o RADIO NEWS. Mr. Fred M. Croft of this same Club has sent us in a very fine report on short-wave receiving conditions in California.

Kilocycle Club of Milwaukee

This club sponsors a 90-minute broadcast program on the Milwaukee Journal Radio Station W9XAZ, every Saturday night beginning at 6 p.m., C.S.T. This station operates on 31.6 megacycles with 500 watts power. The program is of special interest to amateurs and short-wave fans. Reports from listeners are necessary if the programs are to continue. The club has requested that RADIO NEWS cooperate with the broadcasting committee to furnish reports on short-wave transmissions to be given over the air. A letter to Mr. Kaetel, Chairman of the Radio Program Committee has been sent out stating that RADIO NEWS will cooperate to the fullest extent.

The International 6000-12,500 Mile Short-Wave Club

This new organization is perhaps the only organization in the world which *does not* publish any bulletin, our slogan being "Your short-wave magazine is our meeting-place." In order to be a member of this club, pick out any station over the 6,000 mile mark on short-wave, broadcast or phone. You must tune for this station and send in one report each month for three months. Advise the station manager to hold your reception reports until you have sent in the third one and then ask him to send you a three months' verification card which you will then send to Oliver Amlie, President of the Club, c/o RADIO NEWS. A membership card will be returned (with your verification) with a merit stamp for each 6,000 mile station veri. Ten merit stamps equal one gold merit stamp, with the following inscription on it: Official International DX Ace. It will also be the duty of members to send to your President all information regarding stations, frequencies, call letters for publication in RADIO NEWS. The Club will also check up on your reports and turn them all over for publication in this Magazine. Mr. Joseph H. Miller of Brooklyn, New York, is Vice-President of this Club.

The "Ham" Shack

(*Continued from page* 86)

burning out the meter. The meter recommended is calibrated in ranges up to 750 volts. In order to obtain the higher readings (i.e., for 1500 and 2500 volts), the measured voltage will be in direct proportion to the number of divisions on the meter scale. For instance, using the 1500-volt setting, use the 750-volt scale and multiply by two; with the 2500-volt range, use the 250-volt scale and add a cipher.

For taking resistance readings, the test leads are transferred to the "ohm" jacks. The rotary switch is set to the desired range and the tips of the test leads are connected together. The rheostat is then adjusted so that the meter reads at maximum scale. The meter is calibrated for 2000 ohms. Multiply by ten for the 20,000 scale, by 100 for the 200,000 scale and by 1000 for the 2-megohm scale.

It will be found that the parts go together easily if No. 12 tinned copper wire is used for wiring. This wire is quite rigid, and it also may be used as brackets for holding the resistors in place, as may be seen in the illustration.

The list of parts follows:

One—One Milliammeter meter with voltmeter-ohmmeter scale, Beede.
One—panel 5 by 6¼ by ⅛ inches.
Two—bar knobs.
Six—insulated tip jacks.
One—double-pole-double-throw toggle switch.
One—11 point rotary switch, Yaxley.
One—1,000 ohm potentiometer, Electrad.
Seven—resistors, precision type: 200 ohms, 50,000 ohms, 250,000, two 750,000 ohms, 1 megohm and 27.7 ohms, Lynch.
Four—Resistors, stock type: 27,000 ohms, 2,250 ohms, 225 ohms and 100 ohms, Lynch.

Calls Heard

By L. E. Balcom, 294 Summer Street, Malden, Mass., on 40 meter C.W.: CM6CX, K5AG, K5AO, K5AR, K6AGI, TI2RC ('phone), VE5JC, VE5KK, VK3KD, W6ADM, W6AEF, W6AOR, W6AQP, W6AX, W6BIP, W6BWO, W6CSI, W6CSO, W6CVF, W6DJI, W6DZE, W6EAR, W6FFU, W6GDI, W6GHD, W6GIG, W6GLO, W6GNY, W6GPU, W6GSK, W6GXZ, W6HCF, W6HJW, W6INU, W6INZ, W6IUF, W6JGO, W6JSG, W6KEC, W6KGC, W6KMK, W6KNF, W6KSE, W6KSY, W6KUQ, W6KWC, W6KWW, W6KYO, W6KZK, W6LDP, W6LN, W6LNU, W6LRN, W6LVN, W6LWU, W6LZG, W6TM, W7CBP, W7DWQ, X1BX, X3G.

By P. R. Hunter, 457 South Chautauqua, Wichita, Kan., on 20 meter 'phone: CO2HY, CO2KC, CO2LL, CO2RA, CO2SE, CO2WW, CO2WZ, HH5PA, HI7S, K4SA, LU6AP, T1BA, TI3WD, VE2BE, VE2CA, VE2EE, VE2HM, VE3BG, VE3DB, VE3OF, VE3GH, VE3HC, VE3HE, VE3HF, VE3LL, VE3OX, VE4HW, VE4NJ, VP5PA, X1AI, X1G, X1W.

By Robert Legge, Jr., 32 Cleemann, University of Pennsylvania, Philadelphia, Pa., on 40 meter* phone: HL2K, HC1FG, YV5AM, CO2RA, CO2LL, CO2OA, CO2SE, TI5HH, TI2OFR, T12RB, X1G, X1Q, X1HH, X1W, X1CM, X2AI.

* Only amateurs in some foreign countries are permitted to use 'phone on the 40 meter band.

By A. H. Rousseau, 1909 Anderson Street, Manhattan, Kans., on 20 meter 'phone: W1WK, W1KZ, W1CJH, W1AAK, W1AWO, W1AJZ, W1CAA, W1BNN, W1CRW, W1CGY, W1CJV, W2TP, W2AMM, W2GOQ, W2HQY, W2DBV, W2DKA, W2BOK, W2DVU, W2BCP, W2EUG, W2EDW, W2AND, W2GG, W2AJF, W2AVS, W2BYR, W2ZC, W2BYP, W2QZ, W2IDV, W2EXN, W2DMB, W2ACG, W2HFS, W2BCR, W2DQV, W3ACX, W3CQN, W3CRO, W3BFS, W3LP, W3EHS, W3EHY, W3EWN, W3BRO, W3ZXM, W3AXT, W3BFH, W3MD, W3AA1, W3BHJ, W3BPH, W3IX, W3BBB, W3AFW, W4CJ, W4AUP, W4AEW, W4BFB, W4LT, W4FI, W4AHH, W4ZH, W4EJ, W4AZI, W4QN, W5ZA, W5BFS, W5HR, W5SF, W5AHJ, W5AAC, W6CNE, W6BHO, W6FFN, W6KM, W6JYH, W6VKR, W6BZH, W6ATR, W6HLY, W6AVU, W6IED, W6EFC, W6BYW, W6HO, W6AQK, W6EQG, W6BIG, W6ABF, W6EQI, W6ERT, W6IZB, W6GRI, W6HOY, W6ZH, W6GZU, W6ELR, W7FL, W7EUO, W7FP, W7EHL, W7CIL, W7CHP, W7BCU, W7BAW, W7BCI, W8HTX, W8IWG, W8GLY, W8HYZ, W8FC, W8HAF, W8AOC, W8OW, W8EYY, W8AGU, W8KH, W8FKY, W8TT, W8AOU, W8BRJ (W9's omitted) X1A1, X2HH, CE1BC, CO2KC, CO2WZ, CO2RA, CO2WW, CO6OM, HI7G, HI9I, G5ML, HH5PA, VE1DC, VE2BG, VE2CX, VE2BE, VE2CA, VE3LL, VE3OX, VE3BG, VE3ED, VE3DB, VE3BK, VE3JV, VE3DF.

By Ray A. Walters, 508 West Harrison Street, Danville, Ill., on 20 meter 'phone: CO2RA, CO2LL, CO2WZ, CO2JM, CO2JA, CO2JC, CO2WW, CO2KC, CO2HY, CO2SE, CO2SV, CO6OM, VE1BV, VE1EA, VE1BZ, VE1BB, VE1CO, VE1BC, VE1GH, VE2EE, VE2HK, VE2HN, VE2BE, VE3OO, VE3CN, VE3GS, VE3HF, VE3KM, VE3LL, VE3QJ, VE4GQ, VE4FI, VE4GL, VE4KU, VE4AE, VE4GF, VE4HW, VE4LM, VE4CY, VE5HN, X1AI, X1AX, T1BA, X1X, X1W, X1G, X2AH, H17G, H19I, ZT1R, VP3BG, VP5PA, LU1PA, LU6AP, LU8BI, YN1OP, G5BJ, G5ML, HC1FG, W1RD, W1AKY, W1FCU, W1KZ, W1CMD, W1AKB, W2CIF, W2GG, W2EUG, W2BZB, W2MO, W2EXN, W2AOE, W2EOK, W3MD, W3BBO, W3AXT, W4CJ, W4LT, W4BMI, W4BN, W4QZ, W5AXU, W5AOT, W5AUX, W5BFS, W5AMK, W5LA, W5AEB, W5EUB, W5AHJ, W5SF, W5DDP, W5ECL, W5AFQ, W5ZA, W5BKI, W5DCO, W5BLF, W5AXA, W5ASL, W61RX, W6ZH, W6ERT, W6CQD, W6AUD, W6EVJ, W6CIN, W6AZU, W6ESC, W6CQG, W6CZ, W6BUY, W6EIP, W6BMN, W6DEP, W6FFN, W6BHO, W6UT, W6HAA, W6JM, W6CIF, W6DGY, W6KN, W6ENM, W6EM, W6AQK, W6JYH, W6EQI, W6HOE, W6RP, W6DZH, W6HYB, W6BWA, W6BCH, W6BIG, W6ABF, W6BIG, W6EHM, W6GZU, W6EFC, W6EWK, W6FDM, W6HOY, W6IZB, W6AVV, W7BAW, W7CIL, W7BCI, W7JW, W7BC, W7ARK, W7QC, W7EHL, W7ADM, W7COU, W7ND, W7FL, W7AO, W7CHT, W7DNT, W7BCU, W7AIT, W7MD, W7EUO, W7BHN, W7IF, W7BEK, W9SBJ, W9IQA, W9INH, W9LND, W9VV, W9PIY, W9MXM, W9ARK, W9GHY, W9BTO, W9RTQ, W9EKX.

The DX Corner (Broadcast Band)

(*Continued from page* 103)

the Kansas City high-fidelity station on 1530 kc. This folder tells about the station and includes a discussion of the principles of high fidelity. Copies may be obtained without charge by addressing this station, care of First National Television, Inc., Kansas City, Missouri.

Observer Nichols (Conn.): "Total veries received this past season total 124, which include 17 Europeans, 3 South Americans, etc., bringing my total verified log up to 766, which include 121 stations over 2000 miles. Still use the same old t.r.f. 9-tube Philco, 1929 model. With this a GM tuner to sharpen it up. Aerial 100 feet long, 7 strand copper, 35 feet high east and west. Water pipe ground. I still believe the inverted L aerial best for long distance DX on bc band in spite of possible higher noise level."

Observer Kalmbach (New York) has dug into the matter of the "mystery broadcast." According to a recent letter, it appears that this station is not a licensed broadcasting station, which explains why its location cannot be disclosed, even in the veries which it sent out to all those reporting it. Apparently it was working on 985 kc., at the time of the mysterious broadcast, with a power of 25 watts, and was on the air from 4:13-5:47 a.m.

R. S. Phair (New Jersey): Have a veri from KWJJ in which they state that their new frequency is 1040 kc., instead of 1060 kc. Also have a veri from the "mystery station" on 985 kc., heard on March 17th."

Observer Kocsan (Penna.): "Although this was my first season for real DX'ing, I have been a radio fan since 1923 and I think the season just concluded was probably the worst I have experienced to date, atmospheric noises and electrical disturbances being present continuously throughout the winter. In spite of this, I have succeeded in increasing my log from 325 to 722 stations, not counting 96 police, etc."

Observer Wood (Alabama): "Started my log in Sept., 1934, and it now includes 318 stations, with 77 verified (since Feb. 1), including 44 states, Argentina, Haiti, Guatemala, Mexico, Cuba, and Canada. Most of my stations were logged on an 80-ft. double-wire antenna, but recently I have installed a single 300-ft. wire which gives much better results."

Observer Echeshen (Ohio): "Am making plans and preparations for the next DX season. I am experimenting with aerial lengths, different grounds, and plan to have my receiver checked over."

Observer Elcheshen would like to correspond with other DX'ers, especially foreign, and promises to answer all letters received. Address him: Stan Elcheshen, 801 Literary Rd., Cleveland, Ohio.

Paul Byrns (Ohio): "DX has been poor this month. I am getting some QSL cards made with 'Official RADIO NEWS DX Listening Post Observer for the state of Ohio' printed across the top."

Observer Rimer (Kansas): "I have started my usual summer-time job, rebuilding my aerial. The greatest change that I have made so far is the erection of two masts 55 ft. high and 130 feet apart. The aerial I am using at present has a flat top 100 ft. long (east to west), the lead-in

sists of two parallel uninsulated wires spaced 2 inches apart, with a switching arrangement so that I can use it as a 100-ft. Zepp or a 55-ft. vertical aerial or a 155-ft. inverted "L." Using the aerial as a Zepp, I wound my own set matching transformer, 100 turns on the primary and 75 on the secondary, one end to the antenna post and the other grounded direct and no ground used on the receiver."

Observer Johnson (Minn.): "Have increased my log to 699, but could not get one more to make it 700 before writing this report. WKAQ's new address is Box 1414, San Juan, Puerto Rico. The four high-fidelity stations all verify reports. CKTB, Moose Jaw, Sask., has a very nifty verification letter for DX'ers. XEMO's correct address is Box 202, San Diego, Calif. Cuban postcards can be obtained from Mr. Francisco Hierro, Administrator, Secretary de Communications, Administrator de Correos, Havana, Cuba, 25 for 35c. LR4 is a cinch to get after midnight E.S.T., as WBZ leaves the air at that time during the summer."

Observer Hunter (Oregon): "Here are two tips which may be of interest. XEAW, 960 kc., is on the air until 3:30 a.m., E.S.T., and XENT, 910 kc., is on the air until 2 a.m." It is understood that XEAW will sign off at 3:30 regularly hereafter. This is going to be a blow to many listeners who have heretofore made a practice of tuning for Poste Parisien at 2:10 a.m., because XEAW can be depended upon to blanket this station completely.

Observer Covert (Calif.) wants to know if there is any way of getting east-west direction effect with an indoor antenna. Has anyone had any experience that will enable them to offer some suggestions? He further writes, "That mysterious Cuban on 1105 kc. was definitely identified as CMCY by Observer Winkley, but as the station just shifted to 1030 kc. it may be impossible to get it here in California."

Observer Rimer (Oregon): "KSLM, Salem, Oregon, 1370 kc., 100 watts, has been granted unlimited time on the air. KAST, Astoria, Oregon, same frequency and power as KSLM, is a new station added to my log this month. I am experimenting with antennas and will let you know later what I am doing."

Observer Pellatt (England): "Radio Normandie has moved from 1456 kc. to 1113 kc. Eiffel Tower has stepped in and grabbed 1456 kc. London National, North National, and West National have had their power reduced from 50 kw. to 20 kw. According to an official Soviet statement there are about 60 medium-wave broadcast stations in Russia, with RW39 (832 kc.) using 100 kw. power. There are 100 kw. long-wave stations operating on 271, 217.5, 401 and 245 kc. All of the medium-wave stations except RW39 have power between 1 and 35 kw. The new 50 kw. station in West England will be synchronized on the same frequency as some other English station, but which one is not yet known. American listeners may be interested in knowing that our English stations are on the air from 6:15 a.m. to 8 p.m., E.S.T., week days, and 8:30 a.m. to 6:45 p.m. Sundays, except for the national transmitters, which on Sundays do not come on the air until 12:30 p.m."

Observer Prats (Puerto Rico): "This is to inform you that there is a new station in Venezuela. It is YV5BMO, 1300 kc., and its schedule is the same as the short-wave transmitter of the same call."

Observer Lyell (South Africa): "Beginning early in March, reception of American stations has been practically non-existent in South Africa. South American stations, on the other hand, came through exceptionally well throughout the month of March. Here in the vicinity of Johannesburg, European reception is limited to a short time beginning at 11 p.m., and those who set themselves to do it can usually succeed in bringing in quite a few of these stations. The trans-Pacific stations (Japan, Australia, etc.) are seldom heard here, in fact I know of no one who has ever picked them up."

Observer Shepherd (New Zealand): "Americans, both North and South, are coming in well now in New Zealand (May 1) in the late afternoons. Australians are at excellent strength. The Europeans are almost entirely gone and the season for them has proved generally disappointing."

Observer Mathie (New Zealand): "3YA, 720 kc., will be operating on 10 kw. when this appears in print."

Observer Watson (New Zealand): "For those who may not be up to date in their list of Australian stations, it may be well to point out that the following new stations are now operating on the frequencies and with the power indicated:

Kc.	*Call*	*Power*
750	7NT	7000 watts
830	3GI	7000 "
900	4WK	50 "
940	5RM	1000 "
1360	7BU	50 "
1450	4CA	50 "
1490	2TM	50 "

"These stations came on the air during April and May."

A Battery Super

(*Continued from page* 75)

a 2-volt storage battery may be used—or a 2-volt cell of a standard 6-volt storage battery. In either case, long service will be obtained from a single charge, inasmuch as the filament drain of the entire receiver is only .68 amperes. For temporary service dry cells or a 3-volt pack may be used.

The output transformer employed has two output windings. The 4000 ohm winding is for a magnetic or a permanent-magnet type dynamic speaker. This impedance is desirable for operating speakers of these types, because a better match is provided, particularly at the higher audio frequencies. The 2000 ohm winding is preferred for headphones, providing a better impedance match for the medium audio frequency ranges and somewhat attenuating the higher frequencies and therefore, noise. Headphones and speakers can both be left permanently connected to the receiver and one or the other selected at will by means of the toggle switch at the right of the tuning knob.

Builders who do not care to use headphones can obtain permanent magnet type dynamic speakers having a built-in transformer suitable for operation direct from the plates of the type 19 tube. In such an event the output transformer included in this receiver may be eliminated entirely.

A tone control, located on the front of the chassis below the tuning knob has been incorporated primarily for use of the DX'er who wants to reduce noise to a minimum when tuning for weak signals. This control greatly attenuates the higher audio frequencies, when turned to one extreme. Inasmuch as a great deal of the noise heard falls in the higher frequency ranges, it can in this way be very materially reduced without greatly affecting the clarity and volume of speech.

While this receiver was designed with the requirements of the DX'ers uppermost in mind, nevertheless, it is an ideal receiver for those living out in the country where line supply is not available. It has all the features necessary to satisfy the ordinary broadcast listener. The extra features thrown in for the benefit of the DX'er will be found likewise useful to this ordinary listener. If desired, the special tuning meter can be omitted where it is not required for DX work. This is accomplished simply by connecting the tuning meter leads together within the receiver.

So much for the general discussion of the receiver. Ed Glaser who collaborated in the planning of this receiver and who actually designed and constructed this final model will provide complete constructional details in the September issue. It is interesting to point out here that Mr. Glaser has had wide experience in the development of various types of battery operated receivers and is entitled to a great deal of credit for the excellent job he has turned out in this instance.

Talking 12 Miles

(*Continued from page* 93)

reports on our minute 0.6 watts input. Up to 5 or 6 miles, the 75 cm. signal *outperformed the 5 meter rig of 25 times the power!* Up to 10 miles, reception was excellent. Up to 12 miles it was understandable and, at Oak Island Beach, opposite Fire Island, the end of the road, (about 13.5 miles) it was just audible.

Up in the tower other things happened, too. They were bothered with airplane ignition interference which was heard for several miles. But the greatest QRM was not electrical. An automatic device starts the water pump when the water gets to a predetermined level. And when that pump starts, work ceases. A 16 or more inch feed pipe does its bit in filling the tank, the water falling some 20 feet, and closely resembling Niagara in audibility in that enclosed spot.

We haven't room for all the happenings but the fourth test followed three weeks later and, having only a skeleton crew, we simply repeated the previous test, working ¾—5 meter duplex from car to tower and in motion, this time. This, at least, proved the reliability of the baby outfit. Reception was just excellent.

In tuning up with these very low power rigs, an indicator of some sort is very valuable. The new 60 ma., 2 volt pilot lamp serves admirably. It can be seen in the dark when passing 30 ma. or in bright light when passing 35. We placed it in the transmission line to the antenna and, with violent overmodulation, it would glow at half brilliancy when the transmitter was in tune with the antenna.

Arrangements are being made to continue the tests at some more favorable location and also by using large box kites. The following fellows not previously mentioned helped make amateur radio history in these experiments: Ned Smith, W2AWQ; Charles Neubling, W2EKC; Charles Kupfer, W2BWD; Gil MacDonald, W2CHK, Murray Gutman, W2VL and Mil Martin, W2FHR.

The DX Corner
(Short Waves)

(*Continued from page* 121)

HJ4ABA, Medellin, Columbia, 11170 kc., on the air daily, from 11:30 a.m. to 1 p.m. E.S.T. Station uses 100 watts power. (Friedl).

HJ3ABH, Bogota, Columbia, reported on the air 49.76 meters, 6012 kc., daily from 8 to 11 p.m. (reports vary) on air, from 6 to 12:15 daily, 8 to 11 p.m.; 5 to 7 p.m. Another observer says the station signs off 11 p. m. (Lightbourn, Libby, Young, Chamber, Forshay, A. E. Smith, Betances).

HJ1ABD, Cartegena, Columbia, 41.2 meters, 7281.55 kc. reported heard sending music, (Libby, Forshay, Betances).

HJ2ABC, Cucuta, Columbia, 5900 kc. reported on air, 6 to 9:30 p.m. E.S.T. (J. E. Moore).

HJ2ABA, Tunja, Columbia, 48.58 meters, reported on air from 1 to 2 p.m. and 7:30 to 9:30 p.m. E.S.T. (Canfield, and A. W. Griffin).

HJ1ABD, Barranquilla, Columbia, 49.65 meters, 6442 kc. has special program Saturday night from midnight to 1 a.m. E.S.T. and answers letters from short-wave fans (Myers Hughes, Gallagher).

HJ1ABH, Cienaga, Columbia, 6625 kc., heard, from 7 to 9 p.m. E.S.T (Westchester).

YV5RMO, Maracaibo, Venezuela, reported heard on 11700 kc, is an harmonic (Davis, Wadia, Betances, A. O. Smith, Westchester).

PRA8, Pernambuco, Brazil, reported heard on 49.6, 6040 kc., from 6 to 9 p.m. G.M.T. They have an English program from 8 to 8:30 (Mascarenhas).

PSK, Rio de Janeiro, Brazil, reported back on the air, on 8185 kc., sending music at 9:55 p.m. (Gallagher). Listener Zarn says he heard the same station on 8125 kc from 6 to 9 p.m. E.S.T.

KGU, Honolulu, Hawaii, is reported soon to have a short-wave station on the air, on 9570 kc. and on 17780 kc. No schedule is available as yet. Keep an ear tuned for them! (Gallagher).

Daily Japanese Short-Wave Broadcasts

A short-wave broadcast devoted to news and cultural programs has been in progress from Japan since June. The program lasts one hour and starts at 8:30 p.m., E.S.T. It will be broadcast with a power of 20 kw. from the Nazaki Station JVH on a frequency of 14,600 kc. Other frequencies that may be used if conditions make it urgent are JVN on 10660 kc. or JVP on 7510 kc. Comments and suggestions by American short-wave listeners should be sent to the Japanese Consulate, 500 Fifth Avenue, New York City, for transmission to Japan.

Readers Who Are Awarded "Honorable Mention" for Their Work in Connection with This Month's Short-Wave Report

Orley McLaughlin, Thaddeus Grabek, R. J. Herbert, Eric Butcher, H. H. Parker, Hank G. Wedel, Warren Rosenlund, Louis T. Haws, A. H. Dalal, E. B. White, J. B. Canfield, Ferry Friedl, Raymond C. Bussey, A. J. Walker, A. Belanger, Wooster Richard, Keith Ross, A. N. Lightbourn, Richard C. Benoit, Jr., Jerome J. Cassidy, L. R. Rundle, Theodor B. Stark, Oliver Amlie, Irwin Beitman, Charles A. Morrison, J. Martin Dupont, M. Mickelson, Howard A. Olson, Henry Burton, George C. Sholin, Hagop Kouyoumdjian, D. R. D. Wadia, Howard Morse, H. Chas. Kaetel, Dr. Max Hausdorff, Grant C. Butler, R. C. Messer, C. D. Hall, I. F. Wolpe, Jr., Edgar Vassallo, G. Dseisch, Alfred Quaglino, George W. Brinck, Walter W. Winand, Chas. E. Pellet, John E. Greene, M. L. Gavin, Herman Freiss, Theodore Derrick, Reginald Watson, N. C. Smith, H. Mallet-Veale, Kenneth H. Moffatt, L. T. Lee, Jr., Stan Elcheshen, Roy L. Christoph, Jose Cavazos, George Irving, W. A. Cantrell, Edwin Hoover, Arthur Leutenberg, H. L. Zeelenberg, J. Rodriguez Leguizamon, S. Sarasola, Alberto Hoyos, C. H. W. Nason, J. A. Chambers, H. E. J. Smith, Guy R. Bigbee, Alberto Palacio, Milton B. Walton, E. M. O. Godee, Richard Suratt, Jr., Jose Perez, A. E. Vredenburgh, Emerson Cobb, J. Arthur Matthews, Phillip R. Belt, Arthur Lussier, Harry E. Kentzel, James Lawrence Ware, Jr., Manuel Ortiz Gomez, Overton Wilson, E. L. Myers, Robert J. McMahon, W. Bernard Kinzel, G. C. Gallagher, Carl Schradieck, Harold H. Flick, Carl P. Peters, Morgan Foshay, J. B. McCracken, George C. Sholin, Peter Ker, C. McCormick, John C. Kalmbach, Jr., Maxoude Soultanian, Randolph Andrews, Robert Loring Young, Wm. W. Coney, Robert Rogen, George J. Munz, Manuel E. Betances, B. L. Cummins, Russell B. Kenyon, Alan E. Smith, Walter L. Chambers, Vincent M. Wood, Flavio C. Mascarenhas, M. Keith Libby, Howard T. Neupert, Harold W. Bower, A. B. Baadsgaard, James E. Moore, Jr., E. C. Lim, Arthur Whitehair, Eddie C. Zarn, Thursten Clarke, J. V. Duncan, Forrest W. Dodge, Jerry M. Hynek, J. Ira Young, Arthur B. Coover, Bruce Holmgren, Frank Anzalone, Robert Irving, R. C. Messer, Howard Adams, Jr., Bill Deitenbeck, L. W. Mathie, G. W. Twomey, Fred M. Harvey, J. E. Brook, James W. Sheppard, John S. Dirkes, Henry Spearing, Hugh L. Brown, Earl R. Wickham, L. C. Styles, J. W. Adams, Harold J. Self, Albert Griffin, Oscar C. Vogt, Enrico Scala, Jr., W. H. Boatman, Laurence G. Edquist, F. Harold Smith, Charles E. Pellatt, Werner Howald, James L. Davis, Albert Faher, Thos. C. Shedd, Jr., Walter F. Johnson, Rene Arickx, R. Wright, Eugene T. Musser, Felipe L. Saldana, Wm. Schumacher, J. B. Canfield, L. M. Jensen, Leon Tallman, Charles W. Krier, Gaines Hughes, Jr., Thomas Kenney, Baron von Huene, Hen. F. Polm, Keith Ross, Thaddeus Grabek, R. J. Herbert.

Sure-fire Dollars

(*Continued from page* 83)

into another triode-connected 57, arranged as a phase inverter, to give push-pull action without transformers. This feeds into two 53's in push-pull parallel, which in turn drive four 2A3's in push-pull parallel (see Figure 1). With a harmonic content of only 4%, at maximum rated output, and a frequency response as indicated by the curve of Figure 2, this amplifier easily falls in the "wide range" class.

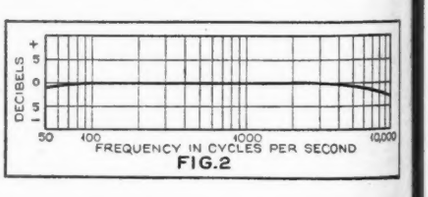


FIG.2

Obtaining field current for the speakers without affecting the power supply regulation was solved in the manner shown in Figure 1. As the amplifier is of the Class "A" type, the operating plate current remains constant, and the plate supply regulation is therefore not dependent on the use of low-resistance elements. The amplifier tubes receive their plate current from a separate filter system, not directly dependent on the speaker fields, as in ordinary circuits. Another innovation in the power system is provision for stabilized bias voltage for the 2A3's. This contributes noticeably to the general stability of the amplifier and to the low harmonic content.

Preceding the amplifier proper is the Electronic Mixer, which permits the use of any input device, regardless of its impedance, as long as it delivers a minimum of .05 volt. This mixer has a slight gain, rather than a loss, the overall gain of the mixer and amplifier combination being 96 db. With this gain, crystal type microphones and phonograph pick-ups can be used directly. The mixer will handle three independent input signals, there being three individual channel controls and one master control. It has no frequency discrimination worth considering, the response being flat from 20 to 10,000 cycles, within 2 db.

The carrying cases are 19½ by 18½ by 13⅝ inches overall, the whole outfit weighing 112 lbs. The speaker cases are split diagonally, each half serving as an effective baffle. When not in use, the speaker openings in front are protected by waterproof covers.

The Service Bench

(*Continued from page* 119)

audio-frequency amplifying transformer. The majority of complaints stated that the transformers so made heated badly and burned out after a few minutes' operation. In every case this is due to an insufficient number of turns on the primary. The required number of turns will vary with the quality of the core and the amount of its use—i.e., the area of the cross-section over which the primary is wound. Mr. Nye specified a primary of 440 turns, which was evidently all right for his core, but insufficient for many other and doubtless smaller cores. The design of a transformer can be made as complicated or as simple as one wishes. For our purpose, we can dispense with a lot of engineering niceties and compute the required number of primary turns in accordance with the following formula:

$$Np = \frac{Ep \times 10^8}{4.44 \times F \times A \times Bm}$$

where Np is the number of primary turns, Ep the primary voltage, F the frequency, A the cross-section area of the core in square inches and Bm the maximum permissible flux density. (In case you don't know what you certainly should know, 10^8 is a convenient way—from the standpoints of shorthand and calculations—of writing 100,000,000.)

With the probability of a good, core, we can take Bm as 8×10^4 (80,000 lines per square inch) and assume that we have on hand a discarded audio transformer having a core ½ inch thick and ¾ inch wide (the length does not enter into this calculation). A will therefore ⅜ square inch. We shall figure Ep as 110 and F, 60—a 110-volt, 60-kilocycle line.

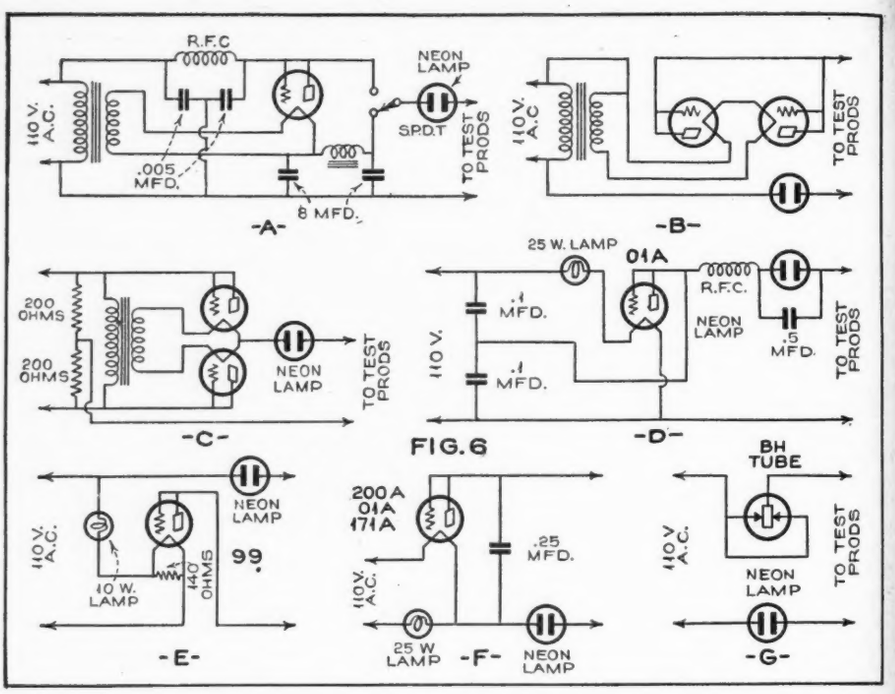
Substituting in the given equation and solving for Np, we find that we will need 1375 turns on the primary. The required number of secondary turns can be readily calculated from the familiar voltage ratio statement:

$$Ns = \frac{Np \times Es}{Ep}$$

where Ns is the correct number of secondary turns, Np the primary turns already established, Es the desired secondary voltage and Ep the primary voltage. Taking Es as 6, in the case of an 01A tube, substitution and solution indicate that 75 turns should be wound on the secondary. Mr. Nye used a No. 33 wire on the primary and number 22 on the secondary—which is satisfactory for use with the device described. In rebuilding the core, whatever air-gap, if any, should be eliminated.

Other complaints of faulty operation have described a steady or intermittent glow on condensers known to be good. This is due to poor rectification—i.e., alternating current getting through the circuit. A different rectifying tube may improve matters, or the voltage across the rectifying tube can be dropped by tapping the voltage from a 1000-ohm bleeder resistor. The voltage should be adjusted until the neon tube is just below the flash point when a good condenser is tested.

Interest in this glow lamp condenser tester is evident by the number of modified circuits we have received, a few of which are shown in Figure 6. These are in the nature of an improvement or simplifications over the original circuit published in our January issue. Shown at A is a more complicated version, but is said by its designer, Mr. Henry Berg, Jr., of Butler, Pa., to give better results. The



single-pole, double-throw switch makes possible an a.c. continuity test through capacitative circuits. The scheme shown at B is contributed by James L. Hoard of Providence, R. I., who happened to have on hand a discarded transformer from a trickle charger. One tube is used merely as a ballast, and a resistor can be substituted for it if desired. Mr. Hoard prefers the tube, however, which is a convenient spare in case the emission drops on the other. Having the two tubes mounted in the test set, we, personally, would be inclined to favor a full-wave rectification circuit, such as is suggested at C.

The remaining circuits are simplifications, in which the transformer has been eliminated. Only minor differences exist among the schemes shown at D, E and F, contributed respectively by J. C. Hanhauser, of Philadelphia, Richard Kobayashi, of Honolulu, and R. A. Ruth, proprietor of the Ruth Electric Shop, Rochester, N. Y. Mr. C. W. Hill, of Fitchburg, Mass., contributes the circuit shown at G, which employs a Raytheon BH tube—a few of which can still be found floating around. Circuits D, E, F and G can be used on either a.c. or d.c.—in the latter case it may be necessary to reverse the 110-volt plug for the correct polarity.

One flash of the neon tube, as the test prods are touched to the condenser terminals, indicates a good condenser. No flash at all is the sign of an open circuit. A continuous flash means a short-circuited condenser, or a bad leak, while intermittent flashing suggests further investigation, with the probability of a leaky condenser. The minimum capacity for which the tester is reliable will depend on several individual factors—voltages, efficiency of

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the rectifier, sensitivity of the neon tube, and perhaps the exact circuit employed. Mr. Berg claims that circuit A will give correct indications on capacities as low as .00005 mfd.

Valentine Super

(*Continued from page* 105)

gain and better inter-channel selectivity was obtainable using 175 kc. than 465 kc. Using variable-coupling transformers this probably still applies as regards gain, but at that we have more gain available at 465 kc. than can ever readily be used, and any degree of selectivity can be attained.

In the plate circuit of the modulator is a choke-capacity filter. The grid returns of the i.f. tubes are returned to the a.v.c. source or ground through resistance capacity filters. A "pi" filter, consisting of a choke and two 1-mfd. condensers, is interposed between the cathodes of the i.f. tubes and these in turn are returned to ground through a 150-ohm limiting resistor and a 12,000-ohm rheostat. The effectiveness of the latter in controlling i.f. gain is increased by allowing the bleeder current through a 50,000-ohm resistor to flow through the effective resistance of the rheostat. Plate current to the second i.f. amplifier flows through a 0-8 milliampere tuning meter. This affords a means of tuning the r.f. section to resonance, and at the same time gives an indication of signal strength. Filtration of the screen-grid circuit is done in the same manner as for the r.f. amplifiers. In all cases the suppressor grid is tied to the cathode.

As has already been stated, the coupling of the first and second i.f. transformers can be varied. The transformer preceding the diode is set at a fixed degree of coupling. The argument may be advanced that in order to properly align such an i.f. amplifier, a visual resonance indicator is essential. The author does not care to refute this, but can say from his own experience that good results can be obtained without resort to such apparatus. The following method was used: A diagram is provided by the Hammarlund Manufacturing Co., which shows how far the push rod protrudes above the i.f. transformer shield can for various degrees of coupling. What was considered a suitable range of coupling was chosen for the variable transformers and a fairly close coupling in the fixed coupled transformer. A test was then made for ability to completely separate stations on adjacent channels by setting the variables at minimum coupling and adjusting the coupling of the fixed transformer to accomplish this. Coupling was then gradually made closer in the variables by means of the panel control, at the same time watching closely the action of the tuning meter needle. As coupling was made closer the meter indicated increased gain, when using a.v.c. by reduction in plate current. At the same time response to higher frequencies increased audibly and interference from the adjacent station takes place. Further manipulation of the control resulted in still further increase in gain, until a critical point was reached when there was a sudden decrease in gain, accompanied by a sharp break in quality of reproduction.

It was assumed that this occurred when the "valley" in the selectivity curve of the variable transformers could no longer be filled up by the peak of the fixed coupled transformer, and the settings were so altered as to bring this critical point at the maximum coupling position of the panel control, while preserving the ability to separate adjacent stations cleanly when in the loose-coupled position. As tone quality affects us through our sense of hearing, it is logical to believe that alignment is correct for our purpose when reproduction is most pleasing to the ear, proving we have a "good ear for quality." The foregoing presupposes that all i.f. transformers have first been adjusted to the chosen intermediate frequency, when loosely coupled.

In the next installment the author will continue with a discussion of the second detector circuit and the separate audio amplifier.

V-8 Blueprints

READERS desiring more detailed data on the chassis, shields, and mechanical features of this receiver can address inquiries to the author, in care of RADIO NEWS. Mr. Valentine has full mechanical drawings available and is also able to furnish duplicates of the cast aluminum chassis employed in this receiver.

—The Editors.

List of Parts for V-8 Tuner

1 cast aluminum chassis and shield plate
4 interstage shield cans
1 overall shield cover
3 coil shields
4 National "Equitune" condensers, 350 mmfd., or
4 Hammarlund variable condensers, type ML-17
4 Flexible shaft couplings for ¼-inch shaft
4 Hammarlund Star midget condensers, 15 mmfd.
1 Hammarlund Star midget condenser, 35 mmfd.
1 Hammarlund mica condenser, .6 mmfd.
5 Sprague "600" (bathtub) condensers, 1 mfd.
8 Sprague "600" cartridge type condensers, .5 mfd.
6 Sprague "600" cartridge type condensers, .25 mfd.
5 Sprague "600" cartridge type condensers, .05 mfd.
1 Sprague "600" cartridge type condenser, .1 mfd.
1 Sprague "600" cartridge type condenser, dual .1
2 Aerovox mica condenser, type No. 1450, .02 mfd.
1 Aerovox mica condenser, type No. 1467, .001 mfd.
3 Aerovox mica condensers, .00002 mfd.
1 Padding condenser, 450 mmfd.
1 I.R.C. metallized resistor, 2000 ohms, 1 watt
1 I.R.C. metallized resistor, 150 ohms, 1 watt
2 I.R.C. metallized resistors, 250 ohms, 1 watt
1 I.R.C. metallized resistor, 6000 ohms, 1 watt
2 I.R.C. metallized resistors, 10,000 ohms, 1 watt
4 I.R.C. metallized resistors, 20,000 ohms, 1 watt
1 I.R.C. metallized resistor, 50,000 ohms, 1 watt
7 I.R.C. metallized resistors, 100,000 ohms, ½ w.
1 I.R.C. metallized resistor, 2 megohms, ½ watt
1 I.R.C. metallized resistor, 50,000 ohms, 2 watts
1 I.R.C. metallized resistor, 500,000 ohms, ½ w.
2 Clarostat wire-wound potentiometers, 12,000 ohms
1 Centralab potentiometer, 250,000 ohms
1 Centralab potentiometer, 1 megohm
3 r.f. transformers
1 oscillator transformer
3 Hammarlund variable i.f. transformers, type VT-175 or VT-465
1 filament transformer, 2½ v., 12 amps.
6 Hammarlund r.f. chokes, 85 millihenries
2 Hammarlund r.f. chokes, 8 millihenries
1 Hammarlund r.f. choke, 10 millihenries, type CH-10-J
1 300-turn choke (antenna coil)
1 tuning meter, 0-8 ma.
1 National dial, type H
1 brass shaft, ¼ in. diameter by 9½ ins. long
1 brass shaft, ¼ in. diameter by 12 ins. long
1 fibre shaft, ¼ in. diameter by 12 ins. long
1 brass tube 5/16 in. o.d. by ¼ in. i.d. by 12 ins. long
1 fibre shaft (to make bushings), ¼ in. diameter by 4 inches long
7 knobs for ¼ in. shaft
7 Eby pin-pin sockets
2 Eby 5-pin sockets
8 tube shields
5 grid clips
3 pin jacks (insulated)
1 switch, s.p.d.t., jack type
1 bakelite plate, 3/16 in. by 3 ins. by 3¼ ins.
4 fibre strips, 2½ ins. long, 1¼ ins. wide, 1/32 in. thick
1 fibre strip, 2¾ ins. wide, 5 ins. long, 1/32 in. thick
25 feet heavy-duty filament wire
2 rubber grommets (¼ in. hole)
2 feet sphaghetti tubing
3 feet tinned bus bar
3 strips Empire cloth, ½ in. wide by 9 ins. long

1 brass tube, 3/8 in. outside diameter by 5/16 in. inside diameter by 3 ins. long
6 doz. shakeproof lock washers (No. 6)
¼ lb. No. 32 enamel magnet wire
¼ lb. No. 34 enamel magnet wire
celluloid cement
1 sponge rubber kneeling pad
1 Boston Gear Works pinion, type No. C7-169, 32 pitch, 3/16 in. face, 20 T, 5/8 in. p.d.
1 Boston Gear Works rack, type No. G-583, 2 ins. long, 32 pitch, 3/16 in. face.

Impedance Matching

(*Continued from page* 88)

$X_L = 2\pi fL$ ohms
f = frequency in cycles per second
L = the inductance of the coil in henries.

Note that this formula contains a frequency term. This means that an inductance coil has no reactance when f = 0; that is the case for steady d.c. flowing through the coil. It also shows that the reactance of a coil is directly proportional to frequency.

Figures 2(a) and 2(b) show what happens when a 1000 cycle r.m.s. potential of 10 volts is applied to an inductance of .25 henry. Note, in 2(a), that the instantaneous voltage and current are never in phase. The inductive reactance causes the current to lag behind the voltage by a phase difference of 90°. This is a fundamental characteristic of any pure inductance. The result of this phase difference is clearly shown in Figure 2(b). The power is alternately positive and negative for each quarter cycle. This means that whatever energy is stored in the field is returned to the circuit during the same cycle. The net power loss is therefore zero. In practice, of course, there are hysteresis losses in the core material, and, at very high frequencies, some losses due to radiation. These, however, are secondary effects, and are not properties of the inductance itself.

When a potential is applied to a condenser, it opposes the flow of current by building up an equal potential. In the case of d.c. this is quite evident. The condenser merely acquires a charge. If the applied potential is increased, more charge is forced on to the plates of the condenser. If the potential is reduced, some of this energy is returned to the circuit. Thus we see that a condenser also possesses reactance. This property is called capacitative reactance, and is designated by the symbol X_C.

The formula for the equivalent ohmic resistance is:

$$X_c = \frac{1}{2\pi fC} \text{ ohms}$$

C = capacity of condenser in farads

Note that this formula also contains a frequency term, but this time it is in the denominator. This means that, when f = 0, the effective resistance of the condenser is infinite. That is a mathematical statement of the fact that a condenser will not pass d.c. The formula also shows that the effective resistance of a condenser decreases with an increase in frequency. Figures 3(a) and 3(b) show the result of applying a 1000 cycle, 10 r.m.s. volt potential to a .12mfd pure condenser. Note that the effect is similar to the case of a pure inductance, except now the current leads the voltage by a phase difference of 90°. This kind of reactance is often called "negative" reactance and is designated by a minus sign. The net loss of energy is zero as before. The energy merely surges in and out of the condenser.

With the individual behavior of these three elements clearly in mind, we can see how their combined effects are responsible for the characteristic impedance of any electrical apparatus or circuit. Always bear in mind that, however complicated a network may become, it consists merely of combinations of these three elements. Any analysis of the network must be made in terms of the fundamental properties of these elements as discussed above.

Resistance, inductive reactance and capacitative reactance can all be expressed in ohms. These elements combine to determine the general impedance of a network; which is also often expressed in ohms. We might be led to believe that the series impedance of a resistor and a coil is the arithmetical sum of the resistive and reactive components. We must remember, however, that the elements of any impedance have a phase relation as well as individual magnitudes. This means that their resultant effect upon the current flow will never be a simple addition.

Suppose we have a choke coil with a d.c. resistance of 3000 ohms and an inductance rating of 1 henry for a current of 1 milliampere. We want to find its impedance at 1000 cycles. (Remember that, in general, the impedance of any device always varies with frequency).

In analyzing the behavior of a complex device it is always legitimate to look at it as a network built up of its component elements, without losing sight of their proper relation. Figure 4(a) shows the equivalent network of this coil (neglecting distributed capacity). Figure 4(b) is a vector diagram showing the 90° phase difference between the voltages across resistance and inductance. The magnitude and direction of the vector representing the resultant voltage across the impedance, can always be found graphically, by completing the parallelogram, outlined by these components, and drawing its diagonal. The graphical solution in this case shows that ZI = 7 volts. The *magnitude* of the impedance of the coil, for 1000 cycles, is therefore:

$$Z = \frac{7 \text{ volts}}{.001 \text{ amperes}} = 7000 \text{ ohms}$$

But we must also specify its phase angle. By direct measurement the phase angle is approximately 64.5 degrees. Hence, the complete answer to our problem is that:

$$Z = 7000 \text{ ohms } \underline{/64.^\circ 5}$$

This is read: "An impedance of 7000 ohms with a positive phase angle of 64.°5." Both of these values will increase with an increase in frequency.

Precisely the same technique may be applied to find the impedance of any network consisting of two or more simple elements in series. Space will not permit more detailed analysis at this point. If you are interested in mastering this technique try this problem. Given, a 1 mfd. condenser in series with 100 ohms. What is its impedance and phase angle for 1000 cycles? Remember in this case that the reactance vector is *negative* so it is drawn *downward* from the left end of the resistance vector. If your analysis is correct, your answer should be 188 ohms with a phase angle of about 58° *below* the resistance vector. This is called a negative or leading phase angle. This impedance would be written:

$$Z = 188 \text{ ohms } \underline{/58^\circ}$$

This will decrease with an increase in frequency.

In the case of a network of both inductive and capacitative reactance in series with resistance, the reactive vector is the algebraic sum of the two reactive components. What familiar type of circuit do we have when they are equal in magnitude so that they neutralize each other?

It is important that you understand the graphical or vector-diagram method of solving these problems. As a practical tool, however, it is a little too tedious and not sufficiently accurate unless very large diagrams are carefully drawn. The following trigonometric formulas will enable you to use this method without drawing any diagrams; all you will need is a table of trigonometric functions.

$$\text{tangent } \Phi = \frac{2\pi fL - \dfrac{1}{2\pi fC}}{R}$$

This formula, plus a table of tangents, enables you to calculate the phase angle for any combination of reactance and resistance in series. Note that if either of the components is absent from the circuit, this term becomes zero in the formula. Having found Φ you can calculate the magnitude of Z from the relation:

$$Z = \frac{R}{\text{cosine } \Phi}$$

Cosine Φ is also the power factor of the circuit. The available power that can be developed by the circuit is:

$$P = EI \text{ cosine } \Phi \text{ watts}$$

where E and I equal the applied voltage and current as usual. The reactive components of a complex circuit are sometimes called the "wattless" components, because they develop no useful power. Another useful expression for the magnitude of the impedance for any series combination of the three elements is given by,

$$Z = \sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}$$

where $\omega = 2\pi f$

Note that the minimum magnitude that the impedance can ever have is R.

If you desire to become familiar with the use of these formulas, try applying them to the problems given above. They can also be applied to a great many practical problems in radio and audio-frequency work. In future installments we will apply the principles, developed in this article, to the impedance determinations of some practical devices. We shall also discuss some of the important points about impedance measurement and impedance matching.

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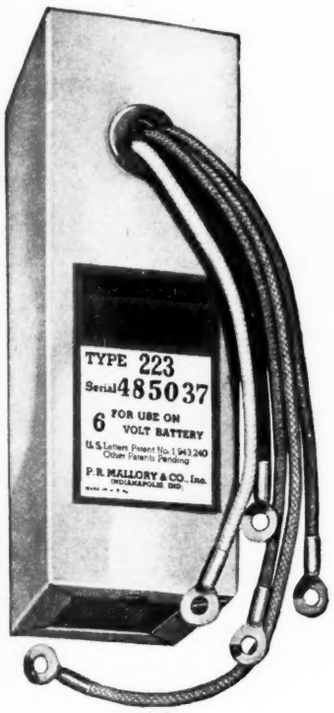

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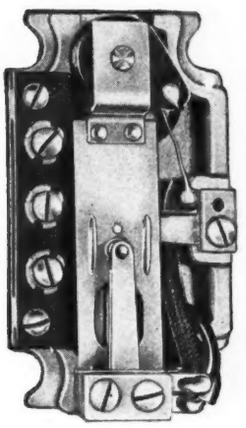

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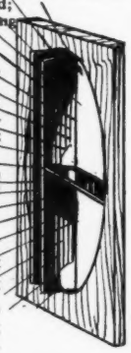

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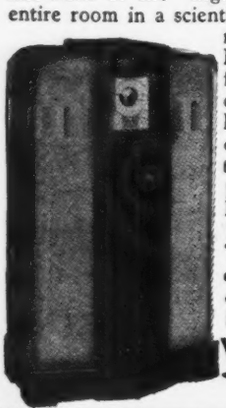

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